



THE UNIVERSITY *of* EDINBURGH

This thesis has been submitted in fulfilment of the requirements for a postgraduate degree (e.g. PhD, MPhil, DClinPsychol) at the University of Edinburgh. Please note the following terms and conditions of use:

This work is protected by copyright and other intellectual property rights, which are retained by the thesis author, unless otherwise stated.

A copy can be downloaded for personal non-commercial research or study, without prior permission or charge.

This thesis cannot be reproduced or quoted extensively from without first obtaining permission in writing from the author.

The content must not be changed in any way or sold commercially in any format or medium without the formal permission of the author.

When referring to this work, full bibliographic details including the author, title, awarding institution and date of the thesis must be given.



New innovations in dementia research:

From a new assessment of premorbid functioning to a review
of the evidence base for post-diagnostic Cognitive Rehabilitation

Joanne Phillips

MA (Hons), MSc

Doctorate in Clinical Psychology

The University of Edinburgh

August 2013

DClinPsychol. Declaration of own work

This sheet must be filled in (each box ticked to show that the condition has been met), signed and dated, and included with all assessments - work will not be marked unless this is done

Name: Joanne Phillips

Assessed work: Thesis

Title of work: New innovations in dementia research: From a new assessment of premorbid functioning to a review of the evidence base for post-diagnostic Cognitive Rehabilitation

I confirm that all this work is my own except where indicated, and that I have:

- Read and understood the Plagiarism Rules and Regulations ✓
 - Composed and undertaken the work myself ✓
 - Clearly referenced/listed all sources as appropriate ✓
 - Referenced and put in inverted commas any quoted text of more than three words (from books, web, etc) ✓
 - Given the sources of all pictures, data etc. that are not my own ✓
 - Not made undue use of essay(s) of any other student(s) either past or present (or where used, this has been referenced appropriately) ✓
 - Not sought or used the help of any external professional agencies for the work (or where used, this has been referenced appropriately) ✓
 - Not submitted the work for any other degree or professional qualification except as specified ✓
 - Acknowledged in appropriate places any help that I have received from others (e.g. fellow students, technicians, statisticians, external sources) ✓
 - Complied with other plagiarism criteria specified in the Programme Handbook ✓
 - I understand that any false claim for this work will be penalised in accordance with the University regulations ✓
- Additionally, for SSR and Thesis submissions:**
- Received ethical approval from the University of Edinburgh, School of Health OR ✓
 - Received ethical approval from an approved external body (e.g. NHS Research Ethics Committee) and registered this application and confirmation of approval with the University of Edinburgh's School of Health's ethical committee ✓

Signature

Date21/08/2013.....

I confirm that this Thesis is my own work, except where indicated, and that I have adhered to the above requirements,

Signature

Date

1. Acknowledgements

I would like to thank all of those who volunteered to participate in the study. I would also like to thank the Scottish Dementia Clinical Research Network, the local community groups and clinicians who supported recruitment into the study.

Many thanks go to my clinical and academic supervisors, Sandy McAfee and Suzanne O'Rourke, for their encouragement and direction in the development and execution of this Thesis.

To my friends and family and to Henry, thank you for your moral support and endless patience. To my fellow trainees, you have been amazing and provided invaluable peer support over the past three years.

2. Thesis abstract

Background

Dementia is a national priority for Scotland, and as such, fast and accurate diagnosis plus responsive and well-evidenced interventions post-diagnosis are key. Accurately estimating an individual's level of premorbid functioning can be a crucial part of establishing that cognitive decline has taken place, enabling clinicians to be more confident and accurate in their diagnosis. Measures that assess premorbid ability should be able to 1) capture current ability in healthy controls and 2) resist the effects of cognitive decline when used in individuals with dementia. At the post-diagnostic stage, there is a growing evidence base for non-pharmacological, tailored interventions for individuals with dementia. However, the evidence base is limited, particularly so for Cognitive Rehabilitation.

Objectives

An empirical study was conducted in order to assess whether a newly developed measure that aims to capture lifelong cognitive reserve (the brain's ability to withstand pathological change), the Cognitive Reserve Index Questionnaire (CRIq), can capture premorbid ability. Three research questions were addressed; 1) does the CRIq capture current ability in healthy controls? 2) is it resistant to cognitive decline when used with a patient group with dementia? and 3) how does the CRIq compare to a traditional measure of premorbid ability, the NART (National Adult Reading Test)? Another focus of development and innovation in dementia research is that of post-diagnostic interventions. A systematic review was therefore conducted in order to evaluate the effectiveness of Cognitive Rehabilitation for

mild-moderate dementia (Alzheimer disease or mixed dementia) in relation to cognitive and functional outcomes. Due to the limited number of RCTs in this field precluding a clear understanding of the evidence base, the additional contribution of non-RCTs was also evaluated.

Method

For the empirical study N=20 healthy older controls and N=13 patients with dementia were recruited. In order to appropriately address the three research questions both groups were assessed using the NART, the CRIq and the MOCA (Montreal Cognitive Assessment). In addition, the control group were assessed on a measure of current ability, the WAIS-IV Perceptual Reasoning Index. For the systematic review of Cognitive Rehabilitation the CDCIG Specialised Register, ALOIS, was searched in order to identify relevant studies. In addition, previous reviews were searched to identify studies excluded on the basis that they were not an RCT.

Results

Results for the empirical study show both CRIq and NART were strongly correlated to current ability (performance on WAIS-IV PRI) in controls, although both significantly over-estimated ability. CRIq performance was not affected by the presence of dementia whereas NART predicted premorbid ability was. CRIq and NART showed a different pattern of results between controls and patients, indicating that CRIq may more resistant to the effects of cognitive decline. Ten studies were identified for the systematic review; five RCT and five non-RCT. Study quality was assessed using a well-validated quality assessment tool, and indicated large variability. Eight of the ten studies reported a positive effect of Cognitive

Rehabilitation. However, several studies were of poor quality and included aspects of other approaches in their intervention (e.g. Cognitive Training, Cognitive-Behaviour Therapy).

Conclusions

The empirical study found that CRIq over-estimated current ability in controls, but was resistant to cognitive decline in patients. The over-estimation of current ability may be accounted for by the CRIq being normed on an Italian population, thus not reflecting UK cultural norms (e.g. for length of schooling). When the NART and the CRIq were directly compared, the two measures were found to be related, but yet produced significantly different estimates of premorbid ability. This suggests that they may capture different facets of premorbid functioning, with the NART being primarily a verbal performance-based measure, and the CRIq capturing aspects of global cognitive functioning. Clinical implications include the potential utility of the CRIq for patients with language impairment. However the study conclusions are limited by a low N, and therefore have restricted generalisability. In the systematic review, the literature was exhaustively searched and evidence was found for the effectiveness of Cognitive Rehabilitation for mild-moderate Alzheimer disease and mixed dementia. Methodological limitations of the included studies are discussed, and clinical implications are identified. Both the empirical study and the systematic review highlight the need for greater research and development of methods by which dementia care is supported; through more effective methods of diagnosis, to a better evidence base for post-diagnostic interventions.

3. Contents

Front page	1
Declaration	2
1. Acknowledgements	3
2. Thesis abstract	4
3. Contents	7
4. SYSTEMATIC REVIEW	10
Abstract	11
Keywords.....	11
Highlights	12
4.1 Introduction	13
4.2 Method	18
4.2.1 Inclusion criteria.....	19
4.2.2 Search strategy.....	22
4.2.3 Assessment of study quality.....	26
4.3 Results	27
4.3.1 Quality of studies.....	26
4.3.2 Characteristics of studies.....	28
4.3.3 Cognitive rehabilitation intervention.....	40
4.3.4 Outcome measures.....	41
4.3.5 Power and effect size.....	46
4.3.6 Summary of main findings.....	47
4.3.7 Synthesis of results according to study dimensions.....	54
4.4 Discussion	59
4.4.1 Findings of current review	59
4.4.2 Strengths of current review	61
4.4.3 Limitations of current review	61
4.4.4 Implications for clinical practice	62
4.5 Conclusions	64
4.6 References	65
5 JOURNAL ARTICLE	76
Title page	76
Abstract	77
5.1 Introduction	78

5.1.1 Study aims and research questions	86
5.2 Method	87
5.2.1 Design	87
5.2.2 Participants	89
5.2.3 Materials	91
5.2.4 Procedures	93
5.2.5 Analysis	96
5.3 Results	97
5.3.1 Research question 1	100
5.3.2 Research question 2	102
5.3.3 Research question 3	104
5.4 Discussion	106
5.4.1 Study limitations	111
5.4.2 Future research	115
5.4.3 Clinical implications	117
5.5 Conclusions	119
5.6 References	120
6 REFERENCES FOR WHOLE THESIS	129
7 APPENDICES	148
 APPENDIX A: SYSTEMATIC REVIEW	 148
Appendix A1: Scopus citations	149
Appendix A2: Quality assessment tool.....	151
Appendix A3: Details of excluded studies	155
Appendix A4: Author guidelines for Systematic Review journal.....	156
 APPENDIX B: JOURNAL ARTICLE	 161
Appendix B1: REC Approval letter	162
Appendix B2: R&D Approval letter	163
Appendix B3: Study Protocol version 5	164
Appendix B4: Participant Information Sheet – Group 1 (Dementia)	172
Appendix B5: Participant Information Sheet – Group 2 (Controls)	177
Appendix B6: Participant Invitation letter – Group 1 (Dementia)	182
Appendix B7: Participant Invitation letter – Group 2 (Controls)	184
Appendix B8: GP Letter – Group 1 (Dementia)	186

Appendix B9: GP Letter – Group 2 (Controls)	187
Appendix B10: Consent form - Group 1 (Dementia)	188
Appendix B11: Consent form – Group 2 (Controls)	190
Appendix B12: Demographic questionnaire	192
Appendix B13: Participant advice sheets	193
Appendix B14: Guidelines for journal submission: Journal of Clinical and Experimental Neuropsychology	195
APPENDIX C: DOCUMENTS FOR REC SUBSTANTIAL AMENDMENT MAY 2013	200
Appendix C1: R&D approval for study amendment	201
Appendix C2: REC approval for study amendment	202
Appendix C3: Protocol Version 9, revised for study amendment	205
Appendix C4: Amended Participant Information Sheet – Group 1 (Dementia)	213
Appendix C5: Amended Participant Information Sheet – Group 2 (Controls)	218

Total word count: 24,270

Word count including references and appendices: 50,066

4. SYSTEMATIC REVIEW

Title: *Cognitive Rehabilitation for dementia: A systematic review of the available evidence*

Running Head title: *Cognitive Rehabilitation for Dementia*

Authors:

Jo Phillips, Trainee Clinical Psychologist, Clinical Psychology, School of Health in Social Science, University of Edinburgh

Suzanne O'Rourke, Lecturer, Clinical Psychology, School of Health in Social Science, University of Edinburgh

Sandy McAfee, Consultant Clinical Psychologist, Head of Service, NHS Lothian Older People's Clinical Psychology

Corresponding author: Jo Phillips, Trainee Clinical Psychologist, Clinical Psychology, School of Health in Social Science, Old Medical School, Teviot Place, The University of Edinburgh, Edinburgh, EH8 9AG

Word count (excl. References and Appendices): 13,872

Prepared in accordance with the author guidelines for *Neuropsychological Rehabilitation – An International Journal*. There is no word limit for articles submitted to this journal.

Abstract

Background

There is a growing evidence base for non-pharmacological interventions for dementia; however, the evidence base for Cognitive Rehabilitation is particularly limited.

Objectives

The current review evaluates the effectiveness of Cognitive Rehabilitation for mild-moderate dementia (Alzheimer disease or mixed dementia) in relation to cognitive and functional outcomes. The limited number of RCTs in this field precludes clear conclusions, and so the additional contribution of non-RCTs to the evidence base is also evaluated.

Method

The CDCIG Specialised Register, ALOIS, was searched in order to identify relevant studies. In addition, previous reviews were searched to identify studies excluded on the basis that they were not an RCT.

Results

Ten studies were identified; five RCT and five non-RCT. Study quality was assessed using a well-validated quality assessment tool, and indicated large variability. Eight of the ten studies reported a positive effect of the intervention. However, several studies were of poor quality and included aspects of other approaches in their intervention (e.g. CT, CBT).

Conclusions

This review has exhaustively assessed the literature and found some evidence for the effectiveness of Cognitive Rehabilitation for mild-moderate Alzheimer disease and mixed dementia. Methodological limitations of studies are discussed, and clinical implications are identified.

Keywords: Dementia, Alzheimer disease, Cognitive rehabilitation, Intervention, Systematic review.

Highlights

- This is the first systematic review to exhaustively examine the literature (including RCTs and non-RCTs) for cognitive rehabilitation interventions in mild-moderate Alzheimer disease and mixed dementia (vascular and Alzheimer disease); focusing on cognitive and functional outcomes;
- There is some evidence to support the effectiveness of cognitive rehabilitation for mild-moderate Alzheimer disease and mixed dementia (vascular and Alzheimer disease), however, included studies vary in their methodological quality;
- Studies are inconsistent in their interpretation of 'cognitive rehabilitation', the duration and number of sessions of the intervention, and the outcome measures used. Many studies did not adequately match the intervention aims to the outcome measure, thus compromising the likelihood of detecting relevant change;
- Additional studies of good quality are required to develop greater understanding of the efficacy of cognitive rehabilitation for dementia; studies should be consistent in their definition of cognitive rehabilitation, should target specific goals, and should ensure that their outcome measures are well matched to the intervention.

4.1 Introduction

Dementia is a disorder characterised by cognitive impairment, and encompasses a variety of cognitive difficulties including memory loss, disorientation, language problems, and changes in personality (NICE, 2011). Cognitive difficulties can have a catastrophic effect on an individual's ability to carry out everyday tasks, and can lead to low self-confidence, anxiety, apathy and low mood (Schoenmakers, Buntinx, & Delepeleire, 2010). Unfortunately, these symptoms can exacerbate cognitive impairment, and so magnify the psychological impact of receiving a diagnosis of dementia.

There are approximately 71,000 people with dementia in Scotland, with an associated annual cost of £1.7billion (The Scottish Government, 2010). With projected population increases skewed towards an aging population, it is estimated that this number will increase to 192,000 by 2040 (The Scottish Government, 2006), although recent evidence suggests that this is increasing at a slower rate than previously anticipated (Matthews, Arthur, Barnes, Bond, Jagger, Robinson et al., 2013). Nonetheless, post-diagnostic support has been identified as an area of service delivery that requires significant development in Scotland (The Scottish Government, 2010), with patients and carers awarded with the right to “maintain maximum independence, physical, mental, social and vocational ability”, via appropriate levels of “rehabilitation” (The Scottish Government, 2010, page 24). There is therefore a clear economic and ethical mandate for a well-developed evidence base regarding the range of interventions for cognitive and functional decline in dementia.

There is a growing evidence base for non-pharmacological interventions targeting cognitive and functional abilities in dementia (Spector, Orrell & Hall, 2012; Olazarán, Reisberg, Clare, Cruz, Peña-Casanova, del Ser et al., 2010). The underlying basis of these

approaches draws upon evidence that some abilities can be relatively spared in the early stages of dementia, such as procedural memory (Beaunieux, Eustache, Busson, de la Sayette, Viader, & Desgranges, 2012) and implicit memory (Vanhalle, Var der Linden, Belleville, & Gilbert, 1998). Imaging studies have provided additional weight to this argument, by demonstrating that early pathological changes in Alzheimer's disease (AD) are predominantly located in the hippocampal and entorhinal cortex; the location of memory formation (Hodges, 2000). Techniques such as errorless learning attempt to make use of these relatively spared abilities to facilitate the encoding or recall of information (Anderson, Arens, Johnson, & Coppens, 2001). It is also hypothesised that these techniques help to re-establish links between various representations in neocortical regions that are less severely atrophied in the early stages of dementia.

Interventions targeting cognitive decline have predominantly used three approaches; cognitive stimulation (CS), cognitive training (CT) and cognitive rehabilitation (CR). The definitions used for these approaches are detailed in Table 1.

Table 1. Definition of cognitive interventions based on guidance by Clare, Woods, Moniz Cook, Orrell and Spector (2003)

Intervention	Definition
<i>Cognitive Stimulation (CS)</i>	This approach uses participation in a range of activities to promote the use of cognitive processes (e.g memories of the past). It is aimed at general improvement in abilities through the re-retrieval of salient and relevant personal information, and was originally designed to overcome disorientation and confusion. Reality Orientation (RO) is the most widely established example of this approach, and tends to be delivered in group format.
<i>Cognitive</i>	These interventions focus on the rehearsal of a particular task that relates to a cognitive function (e.g memory or

<i>Training (CT)</i>	attention). This taps into the theoretical assumption that increased practice of a specific cognitive ability leads to generalised improvement in that domain, i.e that the benefit will expand to related abilities. This can be delivered in numerous formats including groups (Cahn-Weiner, Malloy, Rebok , & Ott, 2003), on an individual basis (Beck, Heacock, Mercer, Thatcher, & Sparkman, 1988) or through computerised cognitive training (Heiss, Kessler, Mielke, Szeliés, & Herholz, 1994).
<i>Cognitive rehabilitation (CR)</i>	This approach aims to improve ability rather than performance on specific tasks. There is more of an individual focus, with the targeted abilities agreed upon between the therapist, the individual and where possible, the family. This method attempts to draw upon an individual's strengths and utilise relatively intact domains of memory to facilitate learning, through strategies such as errorless learning (Anderson et al., 2001) and spaced-retrieval (Neely, Vikstrom, & Josephsson, 2009), as well as develop strategies to compensate for impairments (such as external aids).

Studies examining the efficacy of CS for dementia have provided sufficient evidence for it to be recommended by national clinical guidelines. For example, the Scottish Intercollegiate Guidelines Network (SIGN 86, 2006), the National Institute for Clinical Excellence (NICE Guidelines 42, 2006), and the Matrix of Psychological Therapies (2011; which rates CS as "A") all recommend CS for dementia. SIGN 86 recommends it based upon the results of two studies (Davis, Massman and Doody, 2001; and Quayhagen, Quayhagen, Corbeil, Hendrix, Jackson, Snyder, et al., 2000). However, these studies were excluded from a more recent meta-analysis of CS as aspects of the intervention meet criteria for both CS and CT (as defined by Clare et al., 2003). These study results were therefore confounded by poor fidelity to treatment. NICE guidelines (2006) also recommended CS, but note that at the time of publication it had not been directly compared to cholinesterase inhibitors in a randomised control trial, and so it was difficult to partial out the individual effect of CS on cognition. The Matrix (2011) recommends CS based upon the SIGN and NICE guidelines (SIGN 86, 2006; NICE guideline 42, 2006) as well as the results of one RCT by Spector, Thorgrimsen, Woods, Royan, Davies, Butterworth, et al. (2003). Spector et al. (2003) is also

included in a recent Cochrane review that examined all 15 RCTs that have been completed examining CS (Woods et al., 2012; Aguirre, Woods, Spector, & Orrell, 2013). This concluded that CS has a positive effect on cognition, based upon a meta-analysis of data from over 700 individuals, 407 of which received CS. However, some studies included in the review had small N's (e.g. Bottino, Carvalho, Alvarez, Avila, Zukauskas, Bustamante, et al., 2003) and limited information regarding patient randomisation, meaning the studies were not all of high quality. In addition, the nature and severity of impairment was not consistent across all studies; with some only stating that participants met criteria for "dementia" (e.g. Spector et al., 2003), whilst others specified this further as a particular type of dementia, such as AD (e.g. Requena, Maestu, Fernandez & Ortiz, 2006). Even so, there was evidence to support more generalised improvement in communication and social interaction over and above medication effects, addressing the concern raised by NICE (2006). However, Woods et al. (2012) found limited evidence for any benefit to mood or ability to participate in activities of daily living. In addition, no studies included data related to caregiver burden. Another systematic review of RCTs examined which domains of cognition were most able to benefit from CS (Spector, Orrell & Hall, 2012). Again, this found evidence of general cognitive enhancement, but was able to specify this further and identify that memory and language were most amenable to enhancement through CS. Overall, there is a growing evidence base for CS in dementia.

CT is not recommended by either SIGN or NICE. A Cochrane review of CT was completed in 2003 (Clare et al., 2003), updated in 2008 (Clare & Woods, 2008) and again in 2013 (Bahar-Fuchs, Clare & Woods, 2013). The 2008 review included nine RCTs, and examined the effect of the intervention across five domains; scores on cognitive screening

measures; scores on neuropsychological tests; self-reported functioning; informant report of participant functioning and carer's perception of memory and behaviour problems. Whilst no negative effect of CT was detected, no significant benefit was identified for any domain. However, due to the variability of measures used between studies, the number of participants contributing data to each of these domains was low, even when data was pooled. For example, the largest meta-analysis completed in the review was for neuropsychological test performance (change in immediate verbal memory score). This consisted of data from four studies, with a total N of 137 participants, which is still a smaller N than many single studies examining CS (e.g. Spector et al., 2003). The most recent update of this meta-analysis (Bahar-Fuchs et al., 2013) found an additional two RCTs for CT, however, this did not alter the overall findings of the review. In conclusion, there is a minimal evidence base for CT in dementia.

A Cochrane review of CR (Clare & Woods, 2008) undertook a comprehensive search for papers examining CR for dementia. However, they were unable to find any RCTs. This was recently updated (Bahar-Fuchs et al., 2013) using an equally rigorous search strategy, with one RCT identified that met inclusion criteria. The outcome of this single study (Clare, Linden, Woods, Whitaker, Evans, Parkinson, et al., 2010) was promising, with significant improvement in scores on neuropsychological tests and functional ability in patients with AD, which was supported by changes in fMRI data. It also identified several studies of CR that were not RCTs (e.g. Kixmiller, 2002; Hwang, Choi, Yoon, Yoon, Suh, Lee, et al., 2012) but did not include them in the meta-analysis due to strict inclusion criteria for studies. The evidence base for the delivery of CR interventions has potential, but is extremely limited, and based solely on individual studies. There is therefore no published systematic review

(containing more than one study) or meta-analysis of CR for dementia, for either RCTs or non-RCTs.

With an aging population, the demand for interventions targeting cognitive and functional outcomes following dementia diagnosis is set to increase. The evidence for non-pharmacological interventions is rather patchy, particularly for CR interventions, where there are few single studies and virtually no reviews (e.g Olazaran et al., 2010). Clinicians therefore have little evidence base to draw upon when developing post-diagnostic support for patients. A Cochrane review by Clare & Woods, (2008) did not identify any RCTs and so no review could be completed. The recent update (Bahar-Fuchs et al., 2013) was only able to identify one study, and so again the evidence base as a whole was unable to be examined. The current review will build upon these findings by examining studies excluded by Clare & Woods (2008) and conducting a new search for papers in order to review all available evidence for CR for dementia, including non-RCTs.

4.2 Method

The structure of this review follows guidance developed by the Centre for Reviews and Dissemination (CRD, 2009), which forms part of the National Institute for Health Research. It is internationally recognised as a robust guideline for the development of systematic reviews.

4.2.1 Inclusion criteria

Study design

All studies published in English, examining the effect of CR for dementia, were included. This included RCTs and non-RCTs so as to comprise all relevant information and to develop a fully informed understanding of the evidence base. All criteria for study inclusion are based upon those outlined by Clare & Woods (2008), in an attempt to exclude studies of poorer quality (e.g with no comparison group).

Population

- Participants had a medical diagnosis of dementia, according to DSM-IV (American Psychiatric Association, 1995), ICD-10 (World Health Organisation, 1992) or NINCDS-ADRA (McKhann, Drachman, Folstein, Katzman, Price, & Stadlan, 1984). This could be further specified as AD, Vascular (VaD) or mixed dementia. These diagnostic categories were considered together due to limited data.
- No limits were made regarding age of participant, due to limited data.
- Studies were excluded if participants were identified as having a diagnosis of fronto-temporal dementia, as this subtype of dementia is likely to require a significantly different intervention to that of other forms of dementia.
- Data regarding concurrent treatment with cholinesterase inhibitors was noted if possible.
- Severity of dementia was indicated if possible, preferably through performance on a standardised cognitive screening measure or neuropsychological tool such as the Mini-

Mental State Examination (MMSE; Folstein, Folstein, &McHugh, 1975) or the Clinical Dementia Rating (CDR; Hughes, Berg, Danziger, Coben, & Martin, 1982).

- Studies primarily targeted mild-moderate dementia (MMSE score >12 or CDR score < or = 2). However, a small proportion of studies (30%) did not specify the severity of dementia, or included participants in the severe range.
- Participants could be residing at home or in a care home. Interventions could be offered in a variety of settings including; day hospital, at home, as an out-patients. However, participants were excluded if they were resident in a psychiatric institution, or were known to have a co-morbid psychiatric condition.

Intervention

- Studies of CR targeting any aspect of cognitive functioning were included. This might be described as ‘therapy’, ‘training’, ‘stimulation’ or ‘re-training’, but was still included if it met Clare et al.’s (2003) definition of CR. This could include either one or both of the following;
 - Drawing upon preserved or remaining ability by identifying how best to take in or learn important information, or carrying out important tasks (e.g. Kixmiller, 2002);
 - Using compensatory strategies such as external aids, environmental modifications or using techniques to facilitate learning, to reduce demand on memory systems. This includes techniques such as errorless learning (e.g. Anderson et al., 2001);

- Studies were included if they compared the intervention to 'no treatment', 'standard treatment', an alternative cognitive rehabilitation condition, a placebo treatment, or a control condition. 'Standard treatment' might include medical management, relaxation training, or Occupational Therapy.
- No studies were included where the comparison group consisted only of healthy controls; meaning that all studies included at least one comparison group with dementia.
- No limits were set on the number of sessions or duration of intervention.
- Interventions could be delivered in individual or group format, with or without family caregivers.

Outcome measures

Outcomes for the individual with dementia were considered in this review. This attempted to identify whether any changes were evident post-intervention, and whether any changes could be attributed to the intervention itself. Given the nature of dementia, it was unlikely that significant improvement on measures would be seen. Therefore, between-group differences in the trajectory of cognitive decline (between pre-post treatment, for intervention and no-intervention groups) were considered. In this instance, a smaller decline in performance on cognitive measures in comparison to a non-treatment group would be seen as a positive outcome, and would indicate an effective intervention. Therefore, studies were included if at least one of the following measures were recorded pre and post intervention. Additional measures of performance at follow up was considered as desirable but not necessary for inclusion;

- Performance on standardised cognitive screening tests measuring global cognitive function or severity of dementia (e.g. MMSE, CDR);
- Performance on standardised neuropsychological tests that evaluate aspects of cognitive functioning such as memory (e.g. Wechsler Memory Scale-Revised; Wechsler 1987) or executive functioning (e.g. Trail Making Test; Reitan, 1958);
- Performance on a cognitive or functional measure developed specifically for use in the study, where this was relevant to participants' everyday functioning or reflected a core deficit associated with dementia (e.g. face-name recall, remembering to complete a task);
- Self-reported change in cognition (e.g. memory) or health status on standardised measures;
- Self-reported change in mood (e.g. anxiety or depression) on standardised measures;
- Observer, clinician or carer rating of behaviour, everyday functioning (ability to carry out activities of daily living), well-being, quality of life, or neuropsychiatric symptoms.

4.2.2 Search strategy

The Cochrane Dementia and Cognitive Improvement Group Specialised Register, ALOIS (<http://www.medicine.ox.ac.uk/alais/>) was searched in order to identify studies for this review. ALOIS is a comprehensive register of dementia studies and contains records of RCTs, CCT's and open-label studies. Studies are identified from:

- Monthly searches of the major healthcare databases: MEDLINE, EMBASE, PSYCHINFO, CINAHL and LILACS;
- Monthly searches of numerous trial registers including: Centre Watch Clinical Trials Listing Service; CENTRAL (The Cochrane Library); ClinicalTrials.gov;
- Monthly searches of grey literature sources including ISI Conference Proceedings; and worldwide Index to Theses.

The ALOIS database was searched on 9th April 2013. For full details of all sources searched by ALOIS see <http://www.medicine.ox.ac.uk/alois/content/about-alois>. This review therefore builds upon that of Clare & Woods (2008) by including all studies of CR (including RCTs and non-RCTs). Their comprehensive search identified 11 studies but all were excluded as they failed to meet their criterion that they be RCTs. After further examination of these studies, three were identified that would meet the criteria for the current review. A search was therefore completed in order to identify potential studies published since the search was completed for the Clare & Woods (2008) review. The search terms used were taken from Clare & Woods (2008): cognitive stimulation OR cognitive rehabilitation OR cognitive training OR cognitive retraining OR cognitive support OR memory function OR memory rehabilitation OR memory therapy OR memory aid OR memory group OR memory training OR memory retraining OR memory support OR memory stimulation OR memory strategy OR memory management. This retrieved 1014 references. After screening these references based on the health status of the participants, the type of intervention (pharmacological or non-pharmacological) and excluding those published pre-2006 (as this was when the search was completed for Clare & Woods, 2008), this left 117 studies. A secondary search was

undertaken in order to identify any new publications that had not been entered into the ALOIS database at the time of the search (as this is only updated monthly). Therefore, the above search terms were entered into EMBASE, MEDLINE and PSYCHINFO, with results limited to studies of human participants, in the English language, published in 2013. This identified an additional 205 papers. These combined searches therefore resulted in 322 papers. After de-duplication, and a first and second assessment (removing studies based upon reading the title and the abstract), a total of 22 papers were read and assessed for inclusion or exclusion into the systematic review. This revealed a total of seven papers. This therefore increased the total number of studies included in the current review to 10, and meant that the current review includes all RCTs, CCT's and open-label studies examining Cognitive Rehabilitation in dementia. Figure 1 summarises the search strategies used and Appendix A3 lists those studies excluded from the current review and reasons for exclusion.

SEARCH TERMS USED FOR ALL LEVEL 1 SEARCHES:

Cognitive stimulation OR cognitive rehabilitation OR cognitive training OR cognitive retraining OR cognitive support OR memory function OR memory rehabilitation OR memory therapy OR memory aid OR memory group OR memory training OR memory retraining OR memory support OR memory stimulation OR memory strategy OR memory management

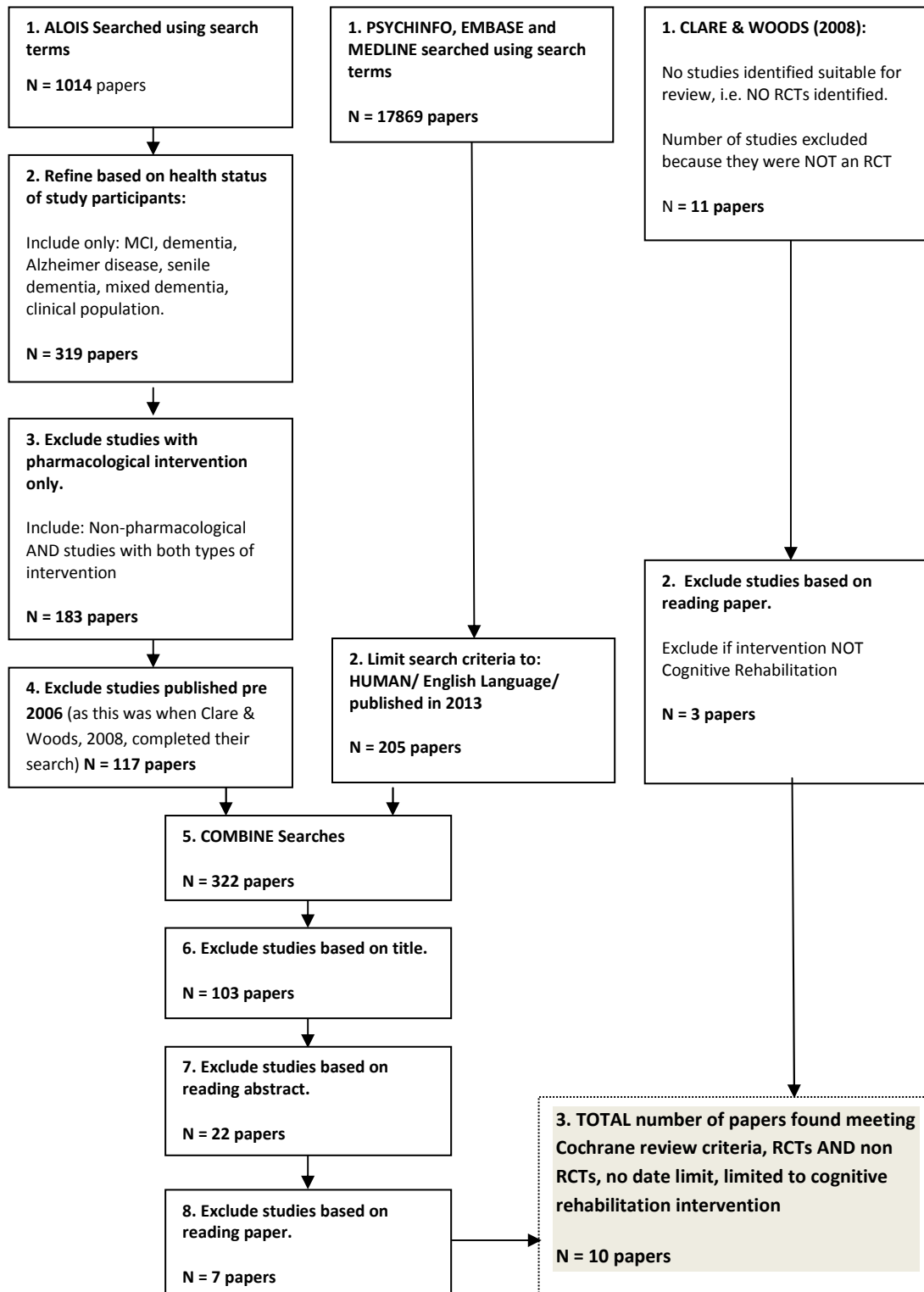


Figure 1. Flow chart of search strategy and study selection process

4.2.3 Assessment of study quality

Quality assessment tools developed for use in systematic reviews, such as those proposed by SIGN or CRD (<http://www.york.ac.uk/inst/crd/>), tend to be relevant only to the evaluation of randomised control trials (RCTs). However, when sufficient RCTs are not available, clinicians and policy makers are required to turn to non-RCTs in order to be able to develop relevant clinical guidelines. For the present review, it is necessary to be able to compare mixed methodologies in order to adequately review the current available evidence. In order to address this problem, Deeks, Dinnes, D'Amico, Sowden, Sakarovitch, Song et al. (2003) evaluated 60 quality assessment tools in order to identify those that are suitable for non-RCTs and for reviews that include both study designs. Deeks et al. (2003) identified six quality assessment tools suitable for this purpose. Of these, the Downs & Black (1998) quality assessment tool was deemed most suitable for the current review.

This quality assessment tool has been cited 970 times since publication (according to Scopus <http://www.scopus.com/home>; searched 7th June 2013), and so has been well-used for this purpose (See Appendix A1; screenshot taken 15/07/13). Downs & Black (1998) has been further adapted by Cahill, Barkham & Stiles (2010) specifically for use in reviews of psychological, practice-based research. Since its publication Cahill et al. (2010) has been used to systematically review psychological interventions on 11 occasions (according to Scopus 7th June 2013; see Appendix A1, screenshot taken 15/07/13). The present review therefore uses the tool developed by Cahill et al. (2010) to assess the quality of each study.

The quality assessment checklist provides an overall score derived from four dimensions; reporting (11 items), external validity (11 items), internal reliability of measurement and treatment (5 items), and internal reliability of confounding variables (5 items). Each item is scored as present (1) or absent (0). This provides a total score out of 32 (see Appendix A2).

Data extraction was completed using a standardised template. Initial coding of papers was completed by the author (JP), using the checklist criteria, which codes each item based on whether the paper addresses the item appropriately; Yes=1, No=0, Unable to determine=0. Secondary coding was completed by an independent doctoral level practitioner who was a Trainee Clinical Psychologist (BP). Initial agreement between raters was good at 87.5%. The majority of these differences were within the External Validity domain, and were resolved via discussion and re-checking of papers, which then resulted in 100% agreement.

4.3. Results

Data from each of the 10 included studies was extracted using a standardised template. Synthesis of data was completed using a narrative approach. Meta-analysis was not undertaken due to the variation in design, outcome measures, and intervention approach between the studies.

4.3.1 Quality of studies

Study quality was assessed using the quality assessment tool developed by Cahill et al. (2010), see Table 2. This provides a basis upon which to compare the methodological

strengths and weaknesses of each study, and identified a large discrepancy between studies. Based upon the quality assessment, Kixmiller (2002) was the least methodologically sound study, scoring 10/32 whilst Clare et al. (2010) was the strongest study methodologically, scoring 30/32. In general, RCTs were of greater quality than non-RCTs (averaging 23.4/32 Vs. 18.4/32). Interestingly, there were several criteria that almost all studies failed to achieve. Quality criteria #13 “representative population – participants” was only met by one study; Clare et al. (2010). Quality criteria #15a “facilities and staff representative of usual treatment” was only achieved by Matsuda, Shido, Haskihai, Shibuya & Kouno (2010). Similarly, quality criteria #12a “representative population – invitees” was only achieved by Clare et al. (2010) and Neely et al. (2009). This suggests that the majority of studies were poor at indicating whether the participants that a) were invited or b) participated in the study, were representative of the sample from which they were recruited; whether the intervention was a variation from the usual treatment offered; and whether therapists were free to use multiple approaches as part of the intervention.

4.3.2 Characteristics of studies

Of the 10 studies included in this systematic review, five were RCTs, and five were non-RCTs (including one series of single cases; one ABA design; one pilot study; and one non-randomised control study). Studies varied in terms of the primary aims, outcome measure (standardised or non-standardised), rehabilitation technique (e.g. errorless learning, spaced-retrieval, mnemonics, vanishing cues) and the type of comparison group (e.g. treatment as usual, relaxation group, medical management, occupational therapy) and so each of these factors will be considered separately. Table 3 summarises the main study characteristics and findings.

Table 2. Quality assessment of studies. RCTs are indicated with *

Study		Anderson <i>et al.</i> , (2001)	Clare <i>et al.</i> , (2002)	Clare <i>et al.</i> , (2010)*	Hwang <i>et al.</i> , (2012)	Kessels <i>et al.</i> , (2009)*	Kixmiller (2002)	Kurz <i>et al.</i> , (2012)*	Matsuda <i>et al.</i> , (2010)	Neely <i>et al.</i> , (2009)*	Niu <i>et al.</i> , (2010)*
Quality criteria		Does study meet criteria? Yes = 1, No = 0, Unable to determine = 0									
1	Aims/ hypothesis	1	1	1	1	1	1	1	1	1	1
2	Outcomes	1	1	1	1	1	0	1	1	1	1
3	Characteristics of participants	1	1	1	1	1	1	1	1	1	1
4	Treatment described	1	1	1	1	1	1	1	1	1	1
5	Confounders	1	1	1	1	1	0	1	1	1	1
6	Findings	1	1	1	1	1	0	1	1	1	1
7	Variability	0	1	1	1	1	0	1	1	1	1
8	Adverse events	1	1	1	1	1	0	1	1	1	1
9	Characteristics of attrition	1	1	1	1	1	1	1	1	1	0
10	Reporting values	0	0	1	1	1	0	1	0	0	1
11	Effect sizes, reliability	0	0	1	1	1	0	0	1	1	0
12a	Representative population – invitees	0	0	1	0	0	0	0	0	1	0
12b	Recruitment	1	1	1	1	0	0	0	1	1	0
13	Representative population – participants	0	0	1	0	0	0	0	0	0	0
14a	Heterogeneity of sample – demographics	0	1	1	1	0	0	1	0	0	0
14b	Heterogeneity of sample – clinical presentation	0	1	1	0	0	1	0	1	1	1
15a	Facilities, staff representative	0	0	0	0	0	0	0	1	0	0
15b	Intervention location – University setting	1	0	1	1	1	1	0	0	0	0
15c	Monitoring of intervention	0	1	1	1	1	0	1	1	1	1
16	Experienced therapists	0	0	1	1	0	0	0	1	0	0
17	Intervention procedure – flexibility	0	0	0	0	0	0	0	0	0	0
18	Training of therapists	1	0	1	1	0	0	1	1	0	1
19	Data dredging	0	1	1	1	1	1	1	1	1	1
20	Appropriate statistical tests	0	1	1	1	1	0	1	1	1	1
21	Fidelity to treatment	1	1	1	1	1	0	1	0	1	1
22	Valid and reliable outcome measures	1	0	1	1	1	0	1	1	1	1
23	Analysis adjusted to length of follow up	1	0	1	1	1	1	1	1	1	1
24	Recruitment population equal for all groups	1	0	1	0	1	1	1	1	1	1
25	Recruitment timing equal for all groups	0	0	1	1	1	0	1	1	0	0
26	Adjustment for confounders	0	0	1	1	1	0	1	1	0	1
27	Attrition accounted for	1	1	1	1	1	1	1	1	1	1
28	Power	0	0	1	0	0	0	1	0	0	0
Total 'Quality score'		16	17	30	25	24	10	23	24	21	20

Quality criteria

- 1 *Is the hypothesis/ aim/ objectives of the study clearly described*
- 2 *Are the main outcomes to be measured clearly described in the introduction or methods section*
- 3 *Are the characteristics of the clients included in the study clearly described*
- 4 *Are the interventions/ treatments of interest clearly described*
- 5 *Are the distributions of principal confounders in each group of clients to be compared (or within a single group) clearly described*
- 6 *Are the main findings of the study clearly described*
- 7 *Does the study provide estimates of the random variability in the data for the main outcomes*
- 8 *Have all the important adverse events that may be a consequence of the intervention/ treatment been reported*
- 9 *Have the characteristics of clients lost to follow-up been described*
- 10 *Have actual probability values been reported (e.g. 0.035 rather than ,0.05) for the main outcomes except where the probability value is less than 0.01*
- 11 *Have sufficient data been provided to enable calculation of outcomes such as pre–post ESs, estimates of reliable and clinically significant change*
- 12a *Were the clients asked to participate in the study representative of the entire population from which they were recruited*
- 12b *Were clients referred through usual clinic routes*
- 13 *Were those clients who were prepared to participate representative of the entire population from which they were recruited*
- 14a *Were client heterogeneous in personal characteristics*
- 14b *Were clients heterogeneous in terms of presenting problems*
- 15a *Were the staff, places, facilities where the patients were treated representative of the treatment the majority of patients receive*
- 15b *Was the treatment conducted in a non-university setting*
- 15c *Was implementation of treatment monitored*
- 16 *Were therapists experienced, professionals with regular caseloads*
- 17 *Were therapists free to use a wide variety of procedures in treatment and not just limited to one treatment procedure*
- 18 *Were therapists trained immediately before the study and in the specific treatment being studied*
- 19 *If any of the results of the study were based on 'data dredging' was this made clear*
- 20 *Were the statistical tests used to assess the main outcomes appropriate*
- 21 *Was the compliance with the intervention/ s/treatments reliable*
- 22 *Were the main outcome measures used accurate (valid and reliable)*
- 23 *Do the analyses adjust for different lengths of follow-up of patients in different treatment groups*
- 24 *Were the clients in different intervention /treatment groups recruited from the same population*
- 25 *Were the clients in different intervention /treatment groups recruited over the same period of time*
- 26 *Was there adequate adjustment for confounding in the analysis from which the main findings were drawn*
- 27 *Were losses of clients to follow-up taken into account*
- 28 *Did the study have sufficient power to detect a clinically important effect where the probability value for a difference being due to chance is less than 5%*

Aims of studies

All included studies aimed to assess the impact of cognitive rehabilitation on participants' cognitive or functional abilities. Not all studies described their intervention as cognitive 'rehabilitation'; however, studies have been included where all or part of the intervention meets the definition of cognitive rehabilitation as described by Clare & Woods (2008).

Characteristics of cohort

All 10 studies in this review recruited participants with a diagnosis of dementia. Nine studies stated that participants met criteria for a diagnosis of dementia according to widely used and well-validated criteria; either ICD-10 criteria (Kurz, Tho, Cramer, Egbert, Frolich, Gertz, et al., 2012), DSM-IV criteria (Kessels & Olde Henskena, 2009; Neely et al., 2009), or NINCDS-ADRA criteria (Clare, Wilson, Carter, Roth & Hodges, 2002; Clare et al., 2010; Hwang et al., 2012; Kixmiller, 2002; Niu, Tan, Guan, Zhang & Wang, 2010). One study mentioned both NINCDS-ADRA and DSM-IV criteria (Matsuda, Shido, Hashikal, Shibuya, Kouno, Hara, & Saito, 2010). Anderson et al., 2001, stated that participants met diagnostic criteria for dementia, but did not specify the criteria used. Eight studies specified the type of dementia diagnosed, with six studies including patients with a diagnosis of AD (according to NINCDS-ADRA or DSM-IV criteria; Clare et al., 2002; Hwang et al., 2012; Kessels, et al., 2009; Kixmiller, 2002; Matsuda et al., 2010; Niu et al., 2010). Two studies included participants with AD, VaD or mixed AD and VaD (Clare et al., 2010; Neely et al., 2009). Six studies specified the severity of dementia using supporting evidence from standardised measures such as MMSE, CDR or GDS (Global Deterioration Scale; Reisberg, Ferris, Leon, et al., 1982). Of these, only one included participants with severe dementia (MMSE <14; Kessels et al., 2009), whilst all other

studies included participants with ‘moderate’, ‘mild’ or ‘minimal’ dementia (MMSE 14-26; Anderson et al., 2002; Clare et al., 2002; Hwang et al., 2012; Kixmiller, 2002; Kurz et al., 2012).

Sample size of groups

The number of participants in the intervention group ranged from small N’s (e.g. Anderson et al., 2001; with N=3 per intervention group) to larger samples (e.g. Kurz et al., 2012; with N=100 in the intervention group). The total number of participants receiving cognitive rehabilitation was N=277, with N=236 receiving either a control condition (e.g. wait-list control) or alternative intervention (e.g. relaxation group, medical management, occupational therapy group). Whilst Clare et al. (2010) received the highest quality score, the sample size used was relatively small (N=21 in the intervention group).

Comparison group

Studies varied in the treatment received by the comparison group. One study compared two rehabilitative techniques (Anderson et al., 2001). One study had a control condition, rather than a control group, meaning that participants acted as their own controls (Clare et al., 2002). One study (Kessels et al., 2009) used a non-dementia group as a control; instead using a ‘somatic’ participant sample. However, this study included two intervention groups, one that received an errorless learning paradigm, and another that used trial and error learning, which effectively comprised a dementia control group, as they received no training in cognitive strategies to aid learning. The remaining eight studies had a dementia comparison group that received no intervention (e.g. wait-list control, standard medical management), or who participated in communication exercises, occupational therapy or

spent the equivalent amount of time completing questionnaires (Clare et al., 2010; Hwang et al., 2012; Kixmiller, 2002; Kurz et al., 2012; Matsuda et al., 2010; Neely et al., 2009; Niu et al., 2010). Kurz et al. (2012) reported significant demographic differences between groups at baseline, despite having the largest sample size.

Table 3. Summary of characteristics of studies and conclusions

Study, Country	Design	Diagnosis	Anti-dementia medication use	Gender (% female)	Mean Age (years) at baseline (s.d. ¹)	Allocation to group	Groups and N per group	Key outcome measure	Follow up	Intervention	No and length of intervention sessions	Findings
Anderson et al., 2001, USA	ABA design	"Probable dementia" within mild-moderate range (MMSE 10-23)	Unclear	33.3%	88.5 (no s.d)	Random	Group A: Errorless Learning group (N=3) Group B: Spaced-retrieval group (N=3)	Orientation measure (List of 22 personal orientation questions)	7 days and 8 days	The purpose of intervention was to train participants to recall personal orientation information using either spaced retrieval or errorless learning. Group A: Errorless Learning Group B: Spaced retrieval technique.	Group A: 12 sessions each 30 minutes duration, 4 per week for 3 weeks. Group B: 12 sessions each 30 minutes duration, 4 per week for 3 weeks.	Improvement was found across all subjects, although no statistical analysis was performed. The spaced retrieval group learned target information quicker than the errorless learning group.
Clare et al., 2002, UK	Series of single-cases using an experimental, standardised, controlled design.	"Probable Alzheimer disease" according to NINCDS-ADRDA; Minimal: MMSE 24+, Mild: MMSE 18-23 CT or MRI to exclude other causes and confirm hippocampal atrophy.	Yes – some participants taking acetylcholinesterase inhibitor, some not; one began during study, two discontinued prior to study (donepezil and rivastigmine)	33.3%	Mean age 71 (range 57-83)	No group allocation. Participants act as own controls.	N= 12	10 free recalls of 12 photographs (asked to name person in photo), given over 3 sessions.	1,3, 6 and 12 months	Intervention: Purpose of intervention was to facilitate participants' learning of photographs using mnemonic, spaced-retrieval, vanishing cues. Participants act as their own controls by being trained on some items, and not on others.	Intervention Group: Six sessions of unknown length.	Just over half of the participants showed clear benefit from the intervention.

¹ S.D = Standard Deviation

[illegible]

Kessels et al., 2009, The Netherlands	RCT	"Dementia" according to DSM-IV criteria for Alzheimer disease. Mild-moderate (MMSE 14-26) or severe (MMSE <14)	Unclear	60%	Severe dementia: Errorless = 83.6 (8.1) Trial & Error= 83.2 (7.1) Mild-moderate dementia: Errorless= 76.5 (7.9) Trial & Error= 77.1 (9.4) Control: Errorless 72.7 (11.0) Trial & error=71.9 (8.9)	Random	Severe dementia: Trial & Error N=10; Errorless N=10 Mild-moderate dementia Trial & Error N=10; Errorless N=10, Control Trial & Error N=10; Errorless N=10.	BADS action programme performance	1-3 days	Participants had to learn a procedural problem-solving task; the Action Programme subtest of the BADS. Two task conditions: Trial & error condition: Standard instructions given. Cues only provided if participant unable to complete next step. Errorless learning condition: Cues are provided before participant completes sequence, so that no errors are made.	Intervention Group: One session unknown length	Performance was superior for the errorless learning group compared to the trial and error learning group across all dementia groups. The benefit was largest after delay testing (after 1-3 days).
Kixmiller, 2002, USA	Pilot study	"Probable Alzheimer disease" according to NINCDS-ADRA criteria. MMSE mean = 20	Unclear	DK	DK	Unclear	Intervention Group N= 5, Control Group N=2.	Ability to carry out event-based or time-based task.	3, 4 and 7 weeks	Intervention Group: Used errorless learning and spaced-retrieval techniques to learn one of two prospective memory tasks: Event-based task: The task was initiated by research assistant calling participant at home. This prompts a series of steps the participant has to take. Time-based task: Participants had to call the research assistant with information at a specified time.	Intervention Group: Six sessions, twice weekly, each lasting 30-120 minutes.	Intervention group performed well in the following 7 weeks post-treatment . No statistical analysis completed.

Control Group:

Completed questionnaires
and tasks.

Kurz et al., 2012, Germany	RCT	"Dementia" according to ICD- 10 criteria. MMSE mean >26 .	Yes – duration unclear, specific cholinesterase inhibitor unclear	44%	Intervention 72.4 (8.55) Control 75.0 (7.05)	Random	Intervention N= 100 Control N= 101	Participant: Primary outcome measure: BADL. Secondary outcome measure: AFIB, DEMQOL, GDS, NPI, WMS Logical memory, TMT, verbal fluency (Regensburg word fluency test), MMSE (German version). Carer: Zarit Buren interview, BDI,	3 months, 9 months	Intervention group: Pre-study training intensive: 1 day. Followed by manualised intervention covering 4 modules: Use of external memory aids; introduction of daily routines (rehabilitation strategies); day structuring; activity planning (cognitive strategies). Control group: Site-specific standard medical management. Not standardised across sites; could vary between OT, physiotherapy, carer counselling, carer support or medication only.	Intervention Group: Pre-training day plus 12 weekly 1 hour individual sessions. Significant effect of intervention on depressive symptoms in females in intervention group.	No significant group effect of intervention on the participants' ability to perform activities of daily living.
Matsuda et al., 2010, Japan	Non-randomised control study.	"Alzheimer disease" according to DSM-IV, and criteria for "probable Alzheimer disease" according to NINCDS-ADRA criteria.	Yes – taking donepezil before entry into study	59%	Intervention Group: 74.65 (8.21) Control Group: 73.50 (7.59)	Unclear.	Intervention Group: N=31, Control Group: N=18.	HDS-R	-	Intervention Group: Completed cognitive exercises and developed learning techniques including cued-recall and word completion exercises Control Group: Wait list.	Intervention Group: 7 sessions, each 30 minutes in length.	Results indicate that combining donepezil with cognitive intervention slowed cognitive decline to a greater extent than donepezil alone.

AFIB: Aachen functional item inventory; BADL: Bayer Activities of Daily living; BADS: Behavioural Assessment of the Dysexecutive Syndrome; BDI: Beck Depression Inventory; COPM: Canadian Occupational Performance Measure; DEMQOL: Quality of Life in Dementia; GDS: Geriatric Depression Scale; GDS-K: Geriatric Depression Scale – Korean version; GHQ-12: General Health Questionnaire; HADS: Hospital Anxiety and Depression Scale; HDS-R: Hasegawa Dementia Scale-Revised; ILS: Independent Living Scales; K-BNT: Korean version of the Boston Naming Test; MARS: Memory Awareness Rating Scale; MMSE: Mini-Mental State Examination; NPI: Neuropsychiatric Inventory; RMBT-II: Rivermead Behavioural Memory Test; ROCF: Rey-Osterrith Complex Figure Test; SVLT: Seoul Verbal Learning Test; TEA: Test of Everyday Attention; TMT: Trail Making Test; WHOQOL-BREF: World Health Organization Quality of Life Assessment, short version; WMS: Wechsler Memory Scale

Anticholinesterase medication

Of the included studies, four were unclear as to whether participants were taking any cholinesterase inhibitor (Anderson et al., 2001; Kessels et al., 2009; Kixmiller, 2001; Neely et al., 2009). Niu et al. (2010) included only participants that had been on a stable dose of donepezil for a minimum of eight weeks prior to the study, whilst Matsuda et al. (2010) included participants that were taking donepezil, but did not specify the length of time it had been prescribed. Similarly, Kurz et al. (2012) stated that participants were taking a cholinesterase inhibitor, but did not specify which medication, nor how long it had been prescribed. Hwang et al. (2012) stated that participants had been on a stable dose for a minimum of eight weeks prior to the study, but did not specify the medication. Finally, both Clare et al. (2002) and Clare et al. (2010) specified that participants had been taking a cholinesterase inhibitor for a minimum of four weeks, including donepezil, rivastigmine and reminy. Clare et al. (2002) also specified that some participants discontinued medication during the study. Only Matsuda et al. (2010) and Clare et al. (2010) had *a priori* planned comparison between those who did and those who did not take medication.

4.3.3 Cognitive rehabilitation intervention

The interventions outlined in the included studies ranged in length from one session (Kessels et al., 2009) to 18 sessions (Hwang et al., 2012), with an average of 10.4 sessions. Session length ranged from 30-120 minutes duration. Of the 10 studies, six assessed the impact of one or more cognitive strategies such as errorless learning, spaced-retrieval or

hierarchical cueing (Clare et al., 2002; Hwang et al., 2012; Kessels et al., 2009; Matsuda et al., 2010; Neely et al., 2009 and Niu et al., 2010). One study examined the impact of a memory aid (Kurz et al., 2012). Two studies examined the impact of memory aids and cognitive strategies (Clare et al., 2010; Kixmiller, 2002). One study compared two different strategies (Anderson et al., 2001; errorless learning Vs. spaced retrieval). Only one study actively involved caregivers in the intervention (Neely et al., 2009). Training delivery was unclear for two studies (Matsuda et al., 2010; Kessels et al., 2009). Niu et al. (2010) delivered their intervention in a group format. The remainder used individualised interventions; with rehabilitation taking place either at home (Clare et al., 2002; Clare et al., 2010; Kixmiller, 2002; Neely et al., 2009), in clinic (Hwang et al., 2012; Kurz et al., 2012) or in care homes (Anderson et al., 2001). Interpretation of results was confounded in four studies by the inclusion of additional interventions, such as cognitive stimulation strategies (reality orientation; Hwang et al., 2012; Niu et al. 2010), cognitive training (Matsuda et al., 2010), and psychotherapeutic approaches (Kurz et al., 2012).

4.3.4 Primary outcome measures

Cognition measures

Seven studies included standardised measures as primary outcome indicators (Clare et al., 2010; Hwang et al., 2012; Kessels et al. 2009; Kurz et al., 2012; Matsuda et al., 2010; Neely et al., 2009; Niu et al., 2010). There was no single measure used consistently across all studies; in part due to the studies including versions of the same test in different languages

(e.g. in English; Clare et al., 2010, in German; Kurz et al., 2012; and Korean, Hwang et al., 2012), meaning that their direct comparison was not possible.

The MMSE was used as a measure of global cognitive ability by Hwang et al. (2012; Korean version; Kang, 2006), Kurz et al. (2012; German version; Kessler, Markowitsch & Denzler, 1990) and Niu et al. (2010). In contrast, Matsuda et al. (2010) used the Hasegawa Dementia Scale-Revised (HDS-R; Kato, Shimogaki, Onodera et al., 1991), and Neely et al. (2009) assessed intelligence using the Wechsler Adult Intelligence Scale-Revised (WAIS-R; Wechsler, 1981). Standardised measures of memory ability were used by four studies. Clare et al. (2010) used the Rivermead Behavioural Memory Test (RBMT; Wilson, Cockburn & Baddeley, 1985), whilst Hwang et al. (2012) used the Digit Span subtest of the Wechsler Adult Intelligence Scale-Revised, the Rey Osterrieth Complex Figure task (RCFT; Loring, Lee, & Meador, 1988) and the Seoul Verbal Learning Test (SVLT). Kurz et al. (2012) assessed memory performance using the Wechsler Memory Scale Logical Memory subtest (WMS; Wechsler, 1997), and Neely et al. (2009) assessed memory using the Digit Span subtest of the Wechsler Adult Intelligence Scale-Revised (WAIS-R).

Four studies assessed aspects of executive functioning (such as fluency, processing speed, naming ability, awareness, inhibition). Clare (2010) used the Test of Everyday Attention (map search, elevator counting, elevator counting with distraction subtest, TEA; Robertson, Ward, Ridgeway et al., 1994) and verbal fluency. Hwang et al. (2012) used the Stroop Test, animal fluency, phonemic fluency, calculation, the Korean version of the Boston Naming Test (Kim & Na, 1997), and the Self-Assessment of Cognition to assess executive functioning ability. Kessels et al. (2009) used performance on the Behavioural Assessment of the Dysexecutive Syndrome (BADS; Wilson, Alderman, Burgess, Emslie and Evans, 1996) as

their primary outcome measure. Kurz et al. (2012) used the Trail Making Test (TMT; Reitan, 1958) and verbal fluency. Finally, Neely et al. (2009) assessed executive functioning using category fluency and the Swedish Synonym Test (SST; Dureman & Salde, 1959). Of these seven studies, only Matsuda et al. (2010) discussed the validity and reliability of the measure/s used to assess cognition.

In contrast, Anderson et al. (2001), Clare et al. (2002) and Kixmiller (2001) all used measures created specifically for their study as their primary outcome measure. Anderson et al. (2001) used an orientation measure consisting of 22 personal orientation questions, ranging from “What day is this?” to “What time do you go to lunch?”, with no information provided regarding its reliability and validity. Clare et al. (2002) used participants’ ability to recall correct face-name associations as their primary outcome measure. Again, there was no indication of the reliability and validity of this measure. Kixmiller (2001) used percentage recall of prospective memory tasks as their primary outcome, again without evidence of reliability and validity. Neely et al. (2009) used a combination of both standardised measures (as outlined above) plus four memory tasks (collaborative object recall, clustered; collaborative object recall, random; recall of non-categorisable word; recall of categorisable words) developed specifically for the study.

Functional measures

Three studies included assessment of function as part of their primary outcome measure. For Clare et al. (2010) the Canadian Occupational Performance Measure (COPM; Law, Baptiste, Carswell et al., 2005) was used to assess personal goals and satisfaction, alongside the Independent Living Scale (ILS; Loeb, 1996). Kurz et al. (2012) used the Bayer Activities of

Daily Living (BADL; Hindmarch, et al., 1998) to assess informant/caregiver views on patients' capacity for self-care and self-management and the Aachen Functional Item Inventory (AFIB; Bocker, Eberle & Gauggel, 2007) to assess functional ability. Clare et al. (2002) used the Clifton Assessment Procedure for the Elderly (CAPE; Pattie & Gilleard, 1979) to examine cognitive and behavioural functioning. Both Clare et al. (2010) and Kurz et al. (2012) discussed the reliability and validity of their measures, with Clare et al. (2010) in particular, discussing the link between the study's intervention goals and their outcome measures.

Additional measures

Whilst the majority of studies focused on cognitive and functional change, additional changes in quality of life, mood and behavioural disturbance were assessed by six studies. Mood and satisfaction was assessed by Clare et al. (2010) using the Hospital Anxiety and Depression Scale (HADS; Snaith & Zigmond, 1994) and Quality of Life in Alzheimer disease (QoL-AD; Logsdon, Gibbons, McCurry et al., 1999.). Hwang also used the QoL-AD, Korean version as well as the Geriatric Depression Scale- Korean version (GSD-K; Bae & Cho, 2004), and a satisfaction questionnaire. Changes in mood (depressive symptoms) was assessed by Kurz et al. (2012) using the GDS, by Neeley et al. (2009), using the Beck Depression Inventory (BDI; Beck, Steer & Brown, 1996) and by Clare et al. (2002), using the HADS. Behavioural disturbance was measured by Kurz et al. (2012) and Niu et al. (2010) using the Neuropsychiatric Inventory (NPI; Cummings, 1997). None of these studies discussed the relevance of these measures in relation to their intervention.

Table 4. Summary of primary outcomes measures, domain of measurement and intervention effect size

Study	Primary outcome measure	Domain	Pre-intervention between group effect size calculated using cohen's d	Post-intervention between group effect size	Follow up between group effect size
Anderson et al., 2001	Non-standardised orientation measure	Cognition: Attention and orientation	-	-	-
Clare et al., 2002	Free recall of words	Cognition: Memory	-	-	-
Clare et al., 2010	COPM	Goal performance and satisfaction	ES= -0.011 (COPM Performance CR Vs. RT) ES= -0.022 (COPM Satisfaction CR Vs. NT) ES= 0.000 (COPM Satisfaction CR Vs. RT)	ES= 1.175 (COPM Performance CR Vs. RT) ES= 0.865 (COPM Satisfaction CR Vs. NT) ES= 1.222 (COPM Satisfaction CR Vs. RT)	- - -
Hwang et al., 2012	Neuropsychological test battery and quality of life measure	Cognition and quality of life	ES= 0.674 (K-QoL) ES= 0.081 (K-MMSE)	-	ES= -0.85 (K-QoL) ES= 0.52 (K-MMSE)
Kessels et al., 2009	BADS	Cognition: executive functioning	- -	ES= 0.31(Severe dementia BADS) ES= 0.52(Mild dementia BADS)	ES= 0.60 (Severe dementia BADS) ES= 1.61 (Mild dementia BADS)
Kixmiller, 2002	Adherence to completing event based or time-based task	Cognition: prospective memory	-	-	-
Kurz et al., 2012	BADL	Functional ability	-	-	-
Matsuda et al., 2010	HDS-R	Cognition	ES= -0.192 (HDS-R)	ES= 0.27 (HDS-R)	-
Neely et al., 2009	Memory tasks, Zarit, BDI	Cognition; Memory, caregiver burden, mood.	ES= 0.-0.023 (Categorisable words) ES= 0.200 (Non-categorisable words)	ES= 0.88 (Categorisable words) ES= -0.05 (Non-categorisable words)	- -
Niu et al., 2010	MMSE, NPI	Cognition, behavioural and psychiatric disturbances	-	-	-

BADL: Bayer Activities of Daily living; BADS: Behavioural Assessment of the Dysexecutive Syndrome; BDI: Beck Depression Inventory; COPM: Canadian Occupational Performance Measure; HDS-R: Hasegawa Dementia Scale-Revised; K-MMSE: Korean version of the Mini-Mental State Examination; K-QoL: Korean- Quality of Life; NPI: Neuropsychiatric Inventory; Zarit Carer Burden. CR= Cognitive rehabilitation, NT= No treatment.

4.3.5 Power and effect size

Only two studies reported *a priori* power calculations to determine sample sizes (Clare et al., 2010; Kurz et al., 2012). Both Clare et al. (2010) and Kurz et al. (2012) assumed their planned analyses would be able to detect a large (0.8) effect size significant at the 5% level. Kurz et al. (2012) calculated their required sample size based upon their study having 80% power, whilst Clare et al.'s. (2010) had 78% power to detect a large effect size. Similarly, only three studies provided details of effect sizes at the post-intervention or follow up phase (Clare et al., 2010; Kessels et al., 2009; Matsuda et al., 2009), however, some studies included sufficient data for this to be calculated using the formula for Cohen's *d*: [(treatment mean – control mean)/ pooled standard deviation], see Table 4 for effect sizes (ES). Post-intervention ES ranged from small (0.27) (Matsuda et al., 2010) to large (0.88) (Neely et al., 2009) for performance on memory tasks. Post-intervention performance on measures of executive functioning showed a small ES (0.31) for those with severe dementia, whilst a medium ES (0.52) was found for those with mild dementia (Kessels et al., 2009). A large ES (ranging from 0.865-1.175) was found at post-intervention for a measure of occupational performance (Clare et al., 2010). At follow up, a medium ES (0.52) was found for a measure of global cognition (Hwang et al., 2012). Finally, at follow up a medium ES (0.60) was found for a measure of executive functioning for severe dementia and a large ES (1.61) for mild dementia (Kessels, 2009). Attrition was discussed by all studies, and where relevant, was accounted for.

4.3.6 Summary of main findings

The main findings of each study will be considered in turn, alongside their main strengths and weaknesses:

Anderson et al. (2002) recruited six participants with mild-moderate probable dementia, and compared two approaches (errorless learning and spaced retrieval) for learning personal orientation information. Each group (N=3) received 12 individual sessions of cognitive rehabilitation for 30 minutes over a duration of four weeks at their care home. All participants were tested on their recall of personal orientation information using an orientation measure consisting of 22 items, at pre-intervention, post-intervention and at 7 days and 8 days follow up. Results were primarily descriptive, with no statistical analysis completed. Results showed improvement in recall across all subjects, with the spaced retrieval group learning target information quicker than the errorless learning group. The main strength of this study was the matching of the intervention to the outcome measure; it's main weaknesses were the lack of statistical analysis, low N and short follow up.

Clare et al. (2002) recruited 12 participants with minimal-mild probable AD. No control group was recruited; instead, participants completed an experimental condition and a control condition. Participants received six individual, home-based sessions of unknown length, during which they received training on numerous strategies (mnemonics, spaced-retrieval and vanishing cues) to support learning for one set of photographs (experimental condition), whilst receiving no training for a second set of photographs (control condition). The primary outcome measure was explicit free recall of 10 photographs. Assessment was completed pre-intervention, post-intervention, and at 1, 3, 6, and 12 month follow up.

Results indicated a statistically significant effect of the intervention, whereby recall of trained items and untrained items was improved. This improvement was maintained at 6 months, with scores remaining above baseline at 12 months. Although this study benefitted from matching the intervention to a relevant outcome measure and a substantial length of follow up, the sample size was small and it lacked a control group.

Clare et al. (2010) recruited participants with AD and mixed dementia (AD and VaD), who were on a stable dose of anticholinesterase inhibitor. Participants were randomly allocated to a CR group (N=21), a relaxation group (RT; N=23) or a control group (NT; N=21). The CR group received eight individual, weekly, home-based, one-hour sessions of CR, which included techniques for facilitating learning, stress management, and memory aids, in order to address individual personalised goals. The RT group received an equivalent amount of input during which relaxation techniques were practiced, whilst the NT group received no input pre-post intervention. The primary outcome measure was the COPM, which measures goal performance and satisfaction. Assessment took place at the pre and post-intervention stage, and at a 6 month follow up. Results indicated a significant effect of group; the CR group performing significantly better on the COPM at follow up, with a large effect size. At the 6 month follow up, the CR group rated their memory as better than the RT or NT groups, and carers of the RT group rated their quality of life as better. fMRI data supported these findings by demonstrating increased activation during assessment on a face-naming task for the CR group. Increased cortical activation was found within several visual associative brain regions, particularly during encoding and recognition. Whilst the study reached statistical significance on the outcome measure, it did not achieve clinical significance, defined as

meeting a 'two-point criterion' (Clare et al., 2010), i.e. a two point change in overall score on the COPM. The authors accounted for this by noting that their intervention targeted only a small selection of personal goals, rather than all goals for rehabilitation. In common with the previous studies, Clare et al.'s sample size was relatively small, particularly for the fMRI group but their strong adherence to CR principles, the fMRI data, the calculation of ES and the long term follow up are significant strengths.

Hwang et al. (2012) recruited four groups; an AD intervention group (N=6), AD control group (N=3), aMCI intervention group (N=6) and an aMCI control group (N=5). The intervention groups received 18 individual, clinic-based, weekly sessions of 50 minutes duration, which included aspects of cognitive stimulation (e.g. reality orientation), and aspects of cognitive rehabilitation (e.g. errorless learning). The control groups were allocated to a wait list. Pre-intervention, post-intervention and follow up (the intervention group had a 2 week and 3 month follow up, whilst the control group had a 3 month follow up) assessment was completed. Outcome measures included a neuropsychological assessment, plus a quality of life measure. Results indicated that the AD intervention group performed significantly better on measures of global cognition and executive functioning at post-intervention and follow up than the AD control group, although the AD group benefitted less than the aMCI group. Main strengths of this study include the long term follow up and the inclusion of a clear control group; weaknesses include the confounding of the CR intervention with a CS intervention, not matching the intervention to the outcome measure, and small N.

Kessels et al. (2009) compared learning techniques (trial and error learning and errorless learning) in patients with mild-moderate dementia (N=20) and severe dementia (N=20), as well as a control group without dementia (N=20). Participants were randomly allocated to either an errorless learning condition or a trial and error condition, creating six groups with N=10 per group. The primary outcome measure was performance on the Action Programme subtest of the Behavioural Assessment of the Dysexecutive Syndrome (BADS). The intervention consisted of one session, of unknown duration, with participants learning how to complete the Action Programme using either trial and error learning or errorless learning. Results demonstrated an effect of condition, with all groups performing better following errorless learning compared to trial and error learning. The benefit of condition was largest 1-3 days post-intervention. Strengths of this study include the specific, goal oriented nature of the intervention, with the outcome measure matched to the intervention, and an a priori ES calculation. Limitations include small follow up time and the briefness of the intervention.

Kixmiller (2002) recruited seven participants with probable AD into a pilot programme for improving prospective memory performance. Participants were allocated to two groups; an intervention group (N=5) and a control group (N=2). The intervention group received six individual, home-based, sessions of CR, each lasting 30-120 minutes, during which participants used errorless learning and spaced retrieval techniques to learn one of two tasks; an event-based task, and a time-based task. The control group received no training, but spent time completing questionnaires and "tasks". The primary outcome measure was participants' ability to remember to perform the prospective memory task.

Performance was measured post-intervention and at follow up (3, 4 and 7 weeks). Results were descriptive as no statistical analysis was completed. This indicated that the intervention group performed 'well' compared to the control group at post-intervention and follow up. The main strength of this study is that the intervention was related to the outcome measure; limitations of this study include the small N, the lack of clarity around the intervention itself and the relatively unstandardised nature of the outcome measure.

Kurz et al. (2012) evaluated a cognitive behavioural and cognitive rehabilitation intervention in 201 participants with mild dementia in a multicentre RCT. Participants were randomly allocated to either an intervention group (N=100) or a control group (N=101). The intervention was multicomponent and manualised, with an initial pre-study training day followed by 12 weekly, individual, clinic-based, one-hour individual sessions, conducted in various outpatient settings. The intervention included aspects of CR (e.g. external memory aids) as well as aspects of cognitive-behaviour therapy (e.g. day structuring, activity planning). The control group received site specific treatment as usual; which varied between medication only, carer counselling or occupational therapy input. The primary outcome measure was the Bayer Activities of Daily Living (BADL), and was assessed pre and post-intervention, as well as at three and nine month follow up. Results indicated no significant effect of CR on functional outcomes, patient or carer treatment satisfaction or patient or carer mood at post-intervention or follow up. Interestingly, the only significant finding was an intervention-related improvement in depressive symptoms in females at post-intervention and follow up. The main strengths of this study include the large N and manualised nature of the intervention; limitations include the confounding of the

intervention with principles of CBT, and the lack of a goal-focused, intervention-related outcome measure.

Matsuda et al. (2010) recruited 49 participants with AD all taking donepezil, allocated to either an intervention group (N=31) or a wait list control group (N=18). The intervention group received seven individual, hospital-based, 30 minute sessions comprising aspects of cognitive training (e.g. verbal fluency) and cognitive rehabilitation (e.g. cued-recall and word completion exercises). The primary outcome was performance on the Hasegawa Dementia Scale-Revised (HDS-R). Results indicated a significant decrease in HDS-R, indicating improved cognition. The authors concluded that donepezil plus the cognitive intervention slowed cognitive decline to a greater extent than donepezil alone. The main strengths of this study include the large sample size and the calculation of ES; main limitations include confounding of the intervention with aspects of CT, and the lack of an intervention-related outcome measure.

Neely et al. (2009) examined the effectiveness of a cognitive intervention in participants with AD or VaD, and their partners, in an RCT. The intervention used two learning strategies (hierarchical cueing and spaced-retrieval) to learn a face-naming task, and complete a table setting activity, and was delivered in participants' homes in eight weekly sessions. The intervention was delivered either individually (intervention group, N=10 couples) or collaboratively (with both patients and their partners, N=10 couples). The control group received no input (N=10 couples). Primary outcome measures included four memory tasks, caregiver burden and depression, and were completed at pre and post-intervention. Results showed no group differences on any measures at post-intervention,

indicating no effect of CR. The authors noted that there was anecdotal evidence to suggest that the collaborative intervention improved patients' episodic memory more so than individual interventions. The main strengths of this study include the goal-oriented nature of the intervention; the main limitation was that the outcome measure was not related to the intervention goal, and there was no follow up.

Niu et al. (2010) completed an RCT examining the effect of a cognitive intervention on cognition and neuropsychiatric symptoms in participants with probable AD, who had a stable dose of cholinesterase inhibitor. Participants were randomly assigned to either the intervention (N=16) or control group (N=16). The intervention used aspects of CS (e.g. reality orientation) and CR (e.g. errorless learning) and was delivered in group format over 20 sessions, each lasting 45 minutes, occurring twice per week. The control group participated in 'communication' exercises. The primary outcome measures were MMSE and NPI, which were administered at pre and post-intervention. Results indicated that the cognitive intervention has a significant effect on cognition (MMSE scores), apathy and depression (NPI score). The authors argued that by their participation in communication exercises, the control group also control for the effect of social interaction and so the beneficial effects of the intervention on cognition were not thought to be mediated by social interaction. Additionally, as all groups were taking an acetylcholinesterase inhibitor, this could not account for any group differences. The main strength of this study was the length of the intervention; main limitations include the confounding of the CR intervention with aspects of CS, the lack of a goal-related intervention, the use of outcome measures that were unrelated to the intervention, and the lack of follow up assessment.

4.3.7 Synthesis of results according to study dimensions

Consideration of quality of studies

The ten studies included in this review varied in overall quality score from 10/32 (Kixmiller, 2002) to 30/32 (Clare et al., 2010), with a mean average score of 25.2. Seven good quality studies were identified (scoring 20+ out of a possible 32 on the quality assessment tool). However, one of these studies confounded the intervention through poor fidelity to treatment (by including features of CS; Niu et al., 2010). This therefore leaves six studies of moderate to high quality. Of these, four found a positive effect of CR, whilst two found no evidence for the efficacy of CR.

Consideration of heterogeneity of intervention

Synthesising results of this review is difficult due to the variation in the interventions that are considered 'Cognitive Rehabilitation'. Such interventions are defined by Clare and Woods (2008) as consisting of either: 1) the use of strategies to facilitate learning by utilising relatively spared aspects of cognition, such as errorless learning and 2) the use of strategies to compensate for impairment, such as external aids.

Strategies to facilitate learning

Examples of this approach include errorless learning, spaced retrieval and hierarchical cueing. Kurz et al. (2012) was the only study that did not include this type of approach at all; and interestingly was one of the only studies to find no effect of the intervention. Clare et al. (2010) and Kixmiller (2002) used both CR approaches (strategies and aids) in their

intervention. Therefore, seven studies examined only cognitive strategies to facilitate learning, without the inclusion of external aids. Within the different types of facilitative strategies, errorless learning was used most often, although the majority of studies used more than one strategy. For example, Clare et al. (2002) included spaced-retrieval and mnemonics; Kixmiller (2002) used spaced-retrieval and errorless learning and Anderson et al. (2001) compared errorless learning to spaced retrieval. Both Hwang et al. (2012) and Niu et al. (2010) used errorless learning and reality orientation, the latter of which is classed as a cognitive stimulation approach rather than a CR approach. Whilst Hwang et al. (2012) found a large ES for their intervention, the individual effects of CR and CS cannot be separated and so few conclusions can be made. Results indicate a mixed picture: whilst Neeley et al. (2009) found no effect of such strategies, Clare et al. (2002) did find an effect. In addition, Anderson et al. (2001) found that spaced-retrieval was superior to errorless learning, and Kessels et al. (2009) found that errorless learning was superior to trial and error learning, with a small ES for severe dementia participants post-intervention and a medium ES for mild dementia patients post-intervention, increasing to a medium ES at follow-up for severe dementia, and a large ES at follow-up for mild dementia patients. Finally, Matsuda et al. (2012) found that cued-recall and word completion strategies were superior to no intervention, with a small ES. These results suggest an overall picture in favour of the use of facilitative strategies as part of CR; however, results are unclear as to which particular strategies are most effective.

External memory aids

Two studies examined the efficacy of memory aids in combination with facilitative strategies; Clare et al. (2010) and Kixmiller (2002). In addition, Kurz et al. (2012) used external memory aids without using facilitative strategies, but used cognitive-behaviour therapy (CBT) strategies instead. Kurz et al. (2012) found no effect on cognitive or functional ability, however, their intervention cannot be considered purely CR in nature due to the additional features of CBT. Both Clare et al. (2010) and Kixmiller (2002) concluded that their interventions improved outcomes; based upon goal-related performance and prospective memory performance. Clare et al. (2010) in particular, found a large ES for their intervention. These findings suggest that external memory aids may be a useful feature of CR, however it is not possible to partial out the effects of each aspect of the CR intervention.

Consideration of appropriate outcome measures

A methodological factor highly relevant to this review is the extent to which studies matched the primary outcome measure to the targeted area of learning i.e did the outcome measure capture any change in targeted ability? Four studies used measures that were developed specifically to assess the cognitive domain directly targeted by the intervention; Anderson et al. (2001), Clare et al. (2002), Kixmiller (2002) and Neeley et al. (2009). These studies all used non-standardised measures such as ability to complete a prospective memory task (Kixmiller, 2002) or recall of face-name associations (Clare et al., 2002). Whilst the unstandardised nature of these outcome measures is open to criticism; they do attempt to capture the exact function that the intervention targeted. In contrast, Niu et al. (2010)

measured outcome using MMSE and NPI (i.e. global cognition and behavioural disturbance) whereas the intervention was focused upon memory. A similar problem was encountered by Kurz et al. (2012) who measured overall goal satisfaction, whilst only targeting some goals with the intervention. In this instance it could be argued that the outcome measure was too ambitious, and attempted to measure overall change in functioning, rather than specific aspects of functioning. Similar criticism can be applied to Clare et al. (2010) who measured goal performance and satisfaction, but did not address all clinically relevant goals with the intervention. Given the prevalence of this methodological issue it is surprising that the majority of studies reported an effect of the intervention. This suggests that had the outcome measure been better aligned with the intervention, results may have been more conclusive.

Consideration of intervention consolidation

Clare & Woods (2008) argue that studies investigating CR interventions should measure long term follow up. This is because maintenance of improved functioning is a crucial aim of CR, as is a successful transference of learning to real life settings. Three studies in this review did not measure long term follow up (Matsuda et al., 2012; Neely et al., 2009; Niu et al., 2010). The remaining studies varied in the length of follow up from one day (Kessels et al., 2009) to 12 months (Clare et al., 2002). Four studies found a benefit of the intervention at follow up; Clare et al. (2002), at six month and 12 month follow up; Clare et al. (2010) at six month follow up; Hwang et al. (2012) at three month follow up; and Kessels et al. (2009) at one to three days' follow up.

Interestingly, whilst some of these results were not statistically significant, where results remained above baseline performance, this was seen as a reflection of a maintained benefit (e.g. Clare et al., 2002). This raises an interesting aspect of measurement; no significant change in performance over time (particularly for follow up of six or 12 months) may actually reflect a benefit of intervention for a dementia population, who would normally be expected to show significant decline in performance. It is therefore unfortunate that follow up ES was unable to be calculated for the majority of studies. For the two studies where this could be calculated (Hwang et al., 2012; Kessels et al., 2009), medium to large ES's were found (0.52-1.61). In addition, all studies in this review can be criticised for placing little emphasis upon long terms gains, with only one study (Clare et al., 2002) attempting to measure the amount to which participants practised the strategies they had developed during the intervention. Future studies should attempt to measure this, and include this variable in their analysis, so as to assess the contribution of practice and consolidation of learning on long term outcome. Overall, there is limited evidence to suggest a long term benefit of CR. Future studies should attempt to measure long term gains more appropriately and consistently, whilst also taking account of any attempt by participants to consolidate the strategies they learned during the intervention.

4.4 Discussion

4.4.1 Findings of current review

This systematic review identified all original studies of CR for dementia using a highly rigorous search method. In addition to all RCTs completed on this topic, non-RCTs were included, in order to exhaustively review the literature and develop a clinically relevant summary of findings. It is perhaps surprising then, that only 10 studies were identified. Within these studies, there was significant heterogeneity in methodological quality and study design. Of the 10 included studies, four confounded their findings by including non-CR principles embedded into the intervention; both Niu et al. (2010) and Hwang et al. (2012) included aspects of both CR and CS (e.g. reality orientation), whilst Kurz (2012) included aspects of cognitive-behaviour therapy and Matsuda et al. (2010) included aspects of CT. Of these, only Kurz et al. (2012) reported no effect of the intervention on cognition or functional measures. Of the remaining six, one study (Neeley et al., 2009) found no effect of intervention. The remaining five studies found a positive effect of CR on cognition or functional ability, however these studies vary in their methodological quality. Overall, there is some evidence to support the efficacy of CR for dementia, however, more good quality studies are required in order to develop an evidence base of how such interventions should be delivered in order to gain maximum benefit to patients.

Identifying ways in which the current review adds to previous findings is difficult due to the dearth of comparable research. Whilst general reviews of the literature have

seemingly provided evidence for all non-pharmacological interventions, including CR (e.g. Olazaran et al., 2010), when this is examined more closely, there is in fact only evidence in relation to CT interventions, and only for cognitive outcomes. Little evidence has been gathered for CR interventions. For example, Clare and Woods (2008) and Bahar-Fuchs et al. (2013) attempted to conduct a meta-analysis for CR, but were unable to do so because of strict inclusion criteria meaning only one study of CR was identified. Bahar-Fuchs et al. (2013) acknowledge that limiting reviews to RCTs only may be problematic, as high-quality non-RCTs can have fewer threats to internal validity than some poorly conducted RCTs. The current review therefore attempts to address this problem and build upon the recommendations of past research.

This review supports previous research into the mechanisms underlying non-pharmacological interventions. For example, Beaunieux et al. (2012) and Vanhalle et al. (1998) identified that learning can be facilitated in early dementia by drawing upon relatively spared abilities. The evidence from this review supports this hypothesis, as the majority of studies used strategies to facilitate learning, such as errorless learning or hierarchical cueing, which rely less on areas that are associated with early changes in AD (e.g. Hippocampal regions; Hodges, 2000). In addition, fMRI data from Clare et al. (2010) supported the hypothesis that participants receiving a CR intervention had increased neural activation in visual-associate brain regions during encoding and recognition. This suggests that CR may encourage patients to utilise spared abilities and neural pathways, and adapt them for new learning.

4.4.2 Strengths of current review

This review includes all studies that have compared CR to a control group, control condition or an alternative intervention, for patients with dementia. Previous reviews of CR have focused only on RCTs, meaning that few conclusions can be developed and little guidance can be offered to clinicians. This review therefore has significant implications for clinical practice. The ALOIS database and a past Cochrane review (Clare and Woods, 2008) were used to identify papers for this review. The ALOIS database is updated monthly and so an additional search of three major databases (MEDLINE, EMBASE, PSYCHINFO) was completed to ensure that no recently published papers had been missed. The current review also used a well-validated quality assessment tool that has been identified as suitable for use where RCTs and non-RCTs are included in systematic reviews (Deeks et al., 2003; Cahill et al., 2010). An independent reviewer also rated papers, with 87.5% agreement (increasing to 100% after discussion and re-checking of papers). Using an independently developed, widely-used tool, as well as a secondary reviewer, minimised any subjective bias in the rating of studies and ensured greater methodological quality of this review.

4.4.3 Limitations of current review

The current review was limited to articles published in English, and to those databases included by ALOIS. In addition, the search terms used were based upon those used for a previous Cochrane review of CR (Clare and Woods, 2008). It is therefore possible that these strategies may have inadvertently missed some studies that would have been relevant to

this review. In addition, the heterogeneity of studies means that synthesising and interpreting findings is difficult. An additional weakness of the current review was that authors were not contacted directly, and so there may be unpublished data held by authors that is relevant to this review. Publication bias may also have affected this review, meaning that studies that found little or no effect of CR were not identified. However, given that any addition to this limited literature would be clinically relevant (be it a positive or negative outcome for CR) it is likely that such a study would still be published. However, by not contacting authors directly, any publication bias may have been exacerbated.

4.4.4 Implications for clinical practice

The considerable amount of heterogeneity between studies in this review makes it difficult to develop comprehensive guidelines for clinicians, however the following points should be considered when developing a CR intervention for patients;

- There is evidence to suggest that interventions should draw upon both types of CR strategies, i.e. strategies to facilitate learning plus memory aids;
- It was not possible to draw any conclusions regarding the specific types of facilitative strategies that are most effective. However, errorless learning and spaced-retrieval were used most frequently by the studies in this review. Other strategies include hierarchical cueing, mnemonics and vanishing cues;

- There was no evidence to suggest a negative effect of combining a cholinesterase inhibitor with CR. Indeed, Matsuda et al. (2012) found that combining these approaches was superior to medication alone, although their intervention did combine aspects of CR with CT;
- Outcome measures should be matched to the intervention in order to maximise fidelity;
- Post-intervention consolidation of the intervention should be considered;
- The areas of functioning targeted by the intervention should be linked to patients' goals and be relevant to everyday life;
- Few patterns emerged regarding number of sessions, however, several studies commented that the number of sessions provided should be sufficient to address all relevant goals for the patient;
- Several studies also commented that future interventions should focus on specific goals and apply specific CR strategies extensively to that goal, rather than trying to address multiple goals;
- The majority of studies in this review used CR with mild-moderate AD, VaD or mixed dementia (AD and VaD). This review provides strongest evidence for the efficacy of CR for mild-moderate dementia, with the largest ES's for this group. The ES's for severe dementia were smaller, but still provides some evidence for its efficacy with this group.

4.5 Conclusions

This review included RCTs and non-RCTs and so methodological quality varied greatly. Given that the evidence came from a limited number of trials, with methodological limitations, it is surprising to see that the majority of studies found an effect of the intervention on measures of cognition and functioning. This therefore builds upon findings of previous individual studies, and provides weight to the theoretical underpinnings of CR. Overall, this review has found promising evidence to support the efficacy of CR for mild-moderate dementia. Future research should focus on specific aspects of CR and match the outcome measure to the intervention more explicitly. Clinically, this review suggests that interventions should use strategies to facilitate learning in addition to memory aids in order to produce clinically relevant changes in functioning.

4.6. References

Aguirre, E., Woods, R.T., Spector, A., & Orrell, M. (2013). Cognitive stimulation for dementia: A systematic review of the evidence of effectiveness from randomised controlled trials. *Ageing Research Reviews*, 12, 253– 262

Alzheimer's Scotland. (2008) *What is Dementia?* Edinburgh: Alzheimer's Scotland

American Psychiatric Association. (1995). *Diagnostic and Statistical Manual of Mental Disorders*. IV ed. Washington, DC: American Psychiatric Association

Anderson, J., Arens, K., Johnson, R., & Coppens, P. (2001). Spaced Retrieval Vs Memory Tape Therapy in Memory Rehabilitation for Dementia of the Alzheimer's Type. *Clinical Gerontologist*, 24:1-2, 123-139

Baddeley, A. & Wilson, B.A. (1994). When implicit learning fails: Amnesia and the problem of error elimination. *Neuropsychologia*, 32, 53-68

Bae, J.N., & Cho ,M.J. (2004). Development of the Korean version of the Geriatric Depression Scale and its short form among elderly psychiatric patients. *Journal of Psychosomatic Research*; 57: 297-305

Bahar-Fuchs, A., Clare, L., & Woods, B. (2013). Cognitive training and cognitive rehabilitation for mild to moderate Alzheimer's disease and vascular dementia. *Cochrane Database of Systematic Reviews* 2013, Issue 6. Art. No: CD003260, DOI:10.1002/14651858.CD003260.pub2

Beaunieux, H., Eustache, F., Busson, P., de la Sayette, V., Viader, F., & Desgranges, B. (2012). Cognitive procedural learning in early Alzheimer's disease: impaired processes and compensatory mechanisms. *Journal of Neuropsychology*, 6 (1), 31-42, doi: 10.1111/j.1748-6653.2011.02002.x

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *The Beck Depression Inventory Second Edition Manual*. San Antonio: Psychological Corporation

Beck, C., Heacock, P., Mercer, S., Thatcher, R., & Sparkman, C. (1998). The impact of cognitive skills remediation training on persons with Alzheimer's disease or mixed dementia. *Journal of Geriatric Psychiatry*, 21: 73–88

Bocker, M., Eberle, N., & Gauggel, S. (2007). *Aachen Functioning Item Bank*. Germany: University Hospital of RWTH Aachen, Institute for Medical Psychology and Medical Sociology

Bottino, C.M.C., Carvalho, I.A.M., Alvarez, A.M., Avila, R., Zukauskas, P.R., Bustamante, S.E.Z., et al. (2005). Cognitive rehabilitation combined with drug treatment in Alzheimer's disease patients: a pilot study. *Clinical Rehabilitation*, 19, 861 - 869

Cahill, J., Barkham, M., & Stiles, W.B. (2010). Systematic review of practice-based research on psychological therapies in routine clinic settings. *British Journal of Clinical Psychology*, 49, 421–453

Cahn-Weiner, D.A., Malloy, P.F., Rebok, G.W., & Ott, B.R. (2003). Results of a placebo-controlled study of memory training for mildly-impaired Alzheimer's Disease patients. *Applied Neuropsychology*, 10, 215–223

Clare, L., and Woods, B. (2008). Cognitive rehabilitation and cognitive training for early-stage Alzheimer's disease and vascular dementia. *Cochrane Database of Systematic Reviews*, Issue 4. Art. No.: CD003260. DOI:0.1002/14651858.CD003260

Clare, L., Linden, D.E.J., Woods, R.T., Whitaker, R., Evans, S.J., Parkinson, C.H., van Paasschen, J., Nelis, S.M., Hoare, Z., Yuen, K.L., & Rugg, M.D. (2010). Goal-Oriented Cognitive Rehabilitation for People With Early-Stage Alzheimer Disease: A Single-Blind Randomized Controlled Trial of Clinical Efficacy. *The American Journal of Geriatric Psychiatry*, 18, 10, 928-939

Clare, L., Wilson, B.A., Carter, G., Roth, I., & Hodges, J.R. (2002). Relearning Face–Name Associations in Early Alzheimer's Disease. *Neuropsychology*, 16, (4), 538–547

Clare, L., Woods, R.T., Moniz Cook, E.D., Orrell, M., Spector, A. (2003). Cognitive rehabilitation and cognitive training for early stage Alzheimer's disease and vascular

dementia. *Cochrane Database of Systematic Reviews*, 4, 385–401. Art. No:CD003260.. [DOI: 10.1002/14651858.CD003260]

Cummings, J.L. (1997). The Neuropsychiatric Inventory: assessing psychopathology in dementia patients. *Neurology*, 48, 10S–16S

Davis, R.N., Massman, P.J., & Doody, R.S. (2001). Cognitive intervention in Alzheimer disease: a randomized placebo-controlled study. *Alzheimer Disease and Associated Disorders*, 15(1), 1-9

Deeks, J.J., Dinnes, J., D'Amico, R., Sowden, A.J., Sakarovich, C., Song, F., *et al.* (2003) Evaluating non-randomised intervention studies. *Health Technology Assessment*, 7, 27

Downs, S. H., & Black, N. (1998). The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *Journal of Epidemiological Community Health*, 52, 377–384

Dureman, I., & Salde, H. (1959). *Psychometric and Experimental-Psychological Methods for Clinical Application* (in Swedish). Uppsala, Sweden: Almqvist and Wiksell

Folstein, M. F., Folstein, S. E. & McHugh, P. R. (1975). Mini-mental state: A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*, 12 (3), 189–98

Gallagher-Thompson, D., & Coon, D. (2007) Evidence-based psychological treatments for distress in family caregivers of older adults. *Psychology and Aging*, 22, 37-51

Heiss, W-D., Kessler, J., Mielke, R., Szekely, B., & Herholz, K. (1994). Long-term effects of phosphatidylserine, pyritinol and cognitive training in Alzheimer's disease. Neuropsychological, EEG, and PET investigation. *Dementia*, 5(2), 88–98

Hindmarch, I., Lehfeld, H., de Jongh, P., et al. (1998). The Bayer Activities of Daily Living Scale (B-ADL). *Dementia and Geriatric Cognitive Disorders*, 9 (2), 20–26

Hodges, J. R. (2000). Memory in the dementias. In E. Tulving & F. I. M. Craik (Eds), *Oxford Handbook of Memory* (pp. 441–465). Oxford, England: Oxford University Press

Hughes, C., Berg, L., Danziger, W., Coben, L., & Martin, R. (1982). A new clinical scale for the staging of dementia. *British Journal of Psychiatry*, 140, 566–572

Hwang, H.R., Choi, S.H., Yoon, D.H., Yoon, B., Ju Suh, Y., Lee, D., Han, I., Hong, C. (2012). The Effect of Cognitive Training in Patients with Mild Cognitive Impairment and Early Alzheimer's Disease: A Preliminary Study. *Journal of Clinical Neurology*, 8, 190-197

Kang, Y.W. (2006). A normative study of the Korean-Mini Mental State Examination (K-MMSE) in the elderly. *Korean Journal of Psychology: General*, 25, 1-12

Kato S, Shimogaki. H., Onodera, A. *et al.* (1991). Development of the revised version of Hasegawa's Dementia Scale (HDS-R). *Japanese Journal of Geriatric Psychiatry*; 2, 1339–1347 (in Japanese)

Kessels, R.P.C., & Olde Henskena, L.M.G. (2009). Effects of errorless skill learning in people with mild-to-moderate or severe dementia: A randomized controlled pilot study. *NeuroRehabilitation*, 25, 307–312

Kessler, J., Markowitsch, H.J., & Denzler, P.E. (1990). *Mini-Mental-Status-Test Deutsche Fassung*. Weinheim: Beltz

Kim, H.H., & Na, D.Y. (1997). *The Korean version Boston Naming Test*. Seoul: Hakjisa

Kixmiller, J.S. (2002). Evaluation of Prospective Memory Training for Individuals with Mild Alzheimer's Disease. *Brain and Cognition* 49, 194–255

Kopelman, M.D. (1991). Frontal dysfunction and memory deficits in the alcoholic Korsakoff syndrome and Alzheimer-type dementia. *Brain*, 114 (1A), 117-137

Kurz, A., Tho, A., Cramer, B., Egbert, S., Frolich, L., Gertz, H., Kehl, V., Wagenpfeil, S., & Werhaeid, K. (2012). CORDIAL: Cognitive Rehabilitation and Cognitive-behavioral Treatment for Early Dementia in Alzheimer Disease: A Multicenter, Randomized, Controlled Trial. *Alzheimer Disease and Associated Disorders*, 26, 3, 246-253

Law, M., Baptiste, S., Carswell, A., et al. (2005). *Canadian Occupational Performance Measure*. 4th ed. Ottawa, ON: CAOT Publications ACE

Loeb, P.A. (1996). *Independent Living Scales Manual*. San Antonio: The Psychological Corporation

Logsdon, R.G., Gibbons, L.E., McCurry, S.M., et al. (1999). Quality of life in Alzheimer's disease: patient and caregiver reports. *Journal of Mental Health and Aging*, 5, 21–32

Loring, D. W., Lee, G. P., & Meador, K. J. (1988). Revising the Rey–Osterrieth: Rating right hemisphere recall. *Archives of Clinical Neuropsychology*, 3, 239–247

Matthews, F.E., Arthur, A., Barnes, L.E., Bond, J., Jagger, C., Robinson, L., & Brayne, C. (2013). A two-decade comparison of prevalence of dementia in individuals aged 65 years and older from three geographical areas of England: results of the Cognitive Function and Ageing Study I and II. *The Lancet*, Early Online Publication, doi:10.1016/S0140-6736(13)61570-6

Matsuda, O., Shido, E., Hashikal, A., Shibuya, H., Kouno, M, Hara, C., & Saito, M. (2010). Short-term effect of combined drug therapy and cognitive stimulation therapy on the cognitive function of Alzheimer's disease. *Psychogeriatrics*; 10, 167–172

McKhann, G., Drachman, D., Folstein, M., Katzman, R., Price, D., & Stadlan, E.M. (1984). Clinical diagnosis of Alzheimer's disease: report of the NINCDS-ADRDA Work Group under the auspices of Department of Health and Human Services task force on Alzheimer's disease. *Neurology*, 34, 939–944

Neely, A.S., Vikstrom, S., & Josephsson, S. (2009). Collaborative memory intervention in dementia: Caregiver participation matters. *Neuropsychological Rehabilitation: An international Journal*, 19 (5), 696-715

NHS Scotland. (2006). *Delivering for Mental Health*. Edinburgh: The Scottish Government

National Institute for Health and Care Excellence. (2006). *Dementia: Supporting people with dementia and their carers in health and social care*, CG42. London: National Institute for Health and Care Excellence

National Institute for Health and Care Excellence. (2011). Donepezil, galantamine, rivastigmine and memantine for the treatment of Alzheimer's disease, TA217. London: National Institute for Health and Care Excellence

Niu, Y., Tan, J., Guan, J., Zhang, Z., and Wang, L. (2010). Cognitive stimulation therapy in the treatment of neuropsychiatric symptoms in Alzheimer disease: a randomised controlled trial. *Clinical Rehabilitation*, 24, 1102-1111

Olazarán, J., Reisburg, B., Clare, L., Cruz, I., Peña-Casanova, J., del Ser, T., Woods, B., Beck, C., Auer, S., Lai, C., Spector, A., et al. (2010). Nonpharmacological Therapies in Alzheimer's Disease: A Systematic Review of Efficacy. *Dementia and Geriatric Cognitive Disorders*, 30: 161–178, DOI: 10.1159/000316119

Pattie, A. H., & Gilleard, C. J. (1979). *Clifton Assessment Procedures for the Elderly (CAPE)*. Sevenoaks, England: Hodder & Stoughton.

Petersen, R.C., Doody, R., Kurz, A., Mohs, R.C., Morris, J.C., Rabins, P.V., et al. (2001). Current concepts in mild cognitive impairment. *Archives of Neurology*; 58: 1985-1992

Quayhagen, M.P., Quayhagen, M., Corbeil, R.R., Hendrix, R.C., Jackson, J.E., Snyder, L., et al. (2000). Coping with dementia: evaluation of four nonpharmacologic interventions. *International Psychogeriatrics*, 12, (2), 249-65

Reitan, R.M. (1958). Validity of the Trail Making Test as an indicator of organic brain damage. *Perceptual and Motor Skills*, 8, 271–276

Requena, C., Maestu, F., Fernandez, A., & Ortiz, T. (2006) Effects of cholinergic drugs and cognitive training on dementia: 2-year follow-up. *Dementia and Geriatric Cognitive Disorders*, 22, 339–45

Robertson, I.H., Ward, T., Ridgeway, V., et al. (1994). *The Test of Everyday Attention*. Bury St Edmunds: Thames Valley Test Company

Scottish Intercollegiate Guidelines Network. (2006). *Management of patients with dementia, SIGN 86*. Edinburgh: Scottish Intercollegiate Guidelines Network

Snaith, R.P., & Zigmond, A.S. (1994). *The Hospital Anxiety and Depression Scale*. Windsor: NFER-Nelson

Spector, A., Orrell, M., & Hall, L. (2012). Systematic Review of Neuropsychological Outcomes in Dementia from Cognition-Based Psychological Interventions. *Dementia and Geriatric Cognitive Disorders*, 34, 244–255

Spector, A., Thorgrimsen, L., Woods, B., Royan, L., Davies, S., Butterworth, M., et al. (2003). Efficacy of an evidence-based cognitive stimulation therapy programme for people with dementia: randomised controlled trial. *British Journal of Psychiatry*, 183, 248–54

The Scottish Government. (2010). *Scotland's National Dementia Strategy*. Edinburgh: The Scottish Government

Vanhalles, C., Van der Linden, M., Belleville, S. & Gilbert, B. (1998). Putting names to faces: Use of spaced retrieval strategy in a patient with dementia of the Alzheimer type. *ASHA*

Special Interest Division 2: Neurophysiology and neurogenic speech and language disorders, 8, 17-21

Wechsler, D. (1981). *Wechsler Adult Intelligence Scale—Revised (WAIS—R)*. San Antonio, TX: The Psychological Corporation

Wechsler, D. (1987). *WMS-R: Wechsler Memory Scale – Revised (Manual)*. San Antonio: The Psychological Corporation

Wilson, B. A., Cockburn, J., & Baddeley, A. D. (1985). *The Rivermead Behavioural Memory Test (RBMT)*. Bury St Edmunds, England: Thames Valley Test Company

Woods, B., Aguirre, E., Spector, A.E., & Orrell, M. (2012). Cognitive stimulation to improve cognitive functioning in people with dementia. *Cochrane Database of Systematic Reviews*, Issue 2. Art. No.: CD005562. DOI: 10.1002/14651858.CD005562.pub2.

World Health Organisation. (1992). *The ICD-10 Classification of Mental and Behavioural disorders: Clinical Descriptions and Diagnostic Guidelines*. Geneva: World Health Organisation, Division of Mental Health

5. JOURNAL ARTICLE

Title Page

Title: Can a questionnaire measuring Cognitive Reserve provide an alternative way of estimating premorbid functioning in individuals with dementia? A Pilot Study.

Running Head Title: Cognitive reserve and premorbid functioning

Authors:

Jo Phillips, Trainee Clinical Psychologist, Clinical Psychology, School of Health in Social Science, University of Edinburgh

Suzanne O'Rourke, Lecturer, Clinical Psychology, School of Health in Social Science, University of Edinburgh

Sandy McAfee, Consultant Clinical Psychologist, Head of Service, NHS Lothian Older People's Clinical Psychology

Ken Laidlaw, Senior Lecturer, Clinical Psychology, School of Health in Social Science, University of Edinburgh²

Corresponding author: Jo Phillips, Trainee Clinical Psychologist, Clinical Psychology, School of Health in Social Science, Old Medical School, Teviot Place, The University of Edinburgh, Edinburgh, EH8 9AG.

Word count (excl. References and Appendices): 10,398

Prepared in accordance with the author guidelines for the *Journal of Clinical and Experimental Neuropsychology*. There is no word limit for articles submitted to this journal.

² Affiliation now changed to: Ken Laidlaw, Professor of Clinical Psychology/Programme Director, Department of Clinical Psychology, Norwich Medical School, Faculty of Medicine and Health Sciences, University of East Anglia, Norwich Research Park, Norwich, NR4 7TJ

Abstract**Background**

Measures that estimate premorbid ability should 1) capture current ability in controls and 2) be resistant to cognitive decline.

Objectives

To assess whether the Cognitive Reserve Index Questionnaire (CRIq) and the NART, meet these two criteria.

Method

N=20 older controls and N=13 patients with dementia were recruited and assessed using the NART, the CRIq and a measure of current ability (controls only).

Results

CRIq and NART over-estimated current ability in controls. NART was negatively affected by cognitive decline, whilst CRIq was not.

Conclusions

CRIq did not meet the first criteria, but did meet the second criteria. Better norms for UK populations are required.

Keywords: Premorbid ability, Cognitive ability, Cognitive reserve, Dementia, Assessment.

5.1 Introduction

Diagnosing dementia requires clinicians to establish that a decline in cognitive functioning has taken place in comparison to previous ability or 'premorbid ability'. Clinicians are often required to make this judgement after only a single assessment (Lezak, Howieson, Bigler & Tranel, 2012) and for the vast majority of patients premorbid ability has to be estimated as there is no assessment of ability prior to the perceived onset of decline to allow direct comparison. Accurately establishing a patients' level of premorbid cognitive ability can therefore allow clinicians to be more confident in their diagnosis, rather than relying on a comparison with normative data. This is because whilst normative data can provide information regarding current ability in comparison to population norms, this tells you little about current ability in comparison to previous ability. This is particularly problematic if, for example, a patient performs in the 'average' range on standardised tests, but their premorbid ability is superior. This would mean that compared to their own baseline, their ability is impaired, but their performance may be considered unimpaired based on normative data. An additional problem is that normative data based on demographic information tends to err towards the average, meaning that few people are categorised within the extreme ranges of ability, leading to under-detection of impairment.

Several techniques have been employed to estimate premorbid cognitive functioning including; demographic equations, 'best performance' indicators, and so-called 'hold tests'.

Demographic equations estimate premorbid ability based on information such as education and occupational history (e.g. Barona, Chastain & Reynolds, 1984; Crawford & Allan, 1997). These techniques have the benefit of not relying on current cognitive ability,

are based on large, standardised samples (e.g. Barona et al., 1984) and remove subjective interpretation by the clinician. This therefore means that performance and interpretation are unaffected by current ability. However, this method has been criticised for having range restriction at the extreme ends of ability (i.e. IQ <75 or >125), which may lead to over or underestimation of premorbid ability (Reynolds, 1997).

‘Best performance’ indicators are used when a battery of tests has been completed with the patient. The clinician selects the test with the best performance as an indicator of premorbid ability. Reynolds (1997) argues that this approach is psychometrically flawed and is likely to lead to the over-estimation of premorbid ability. This is because, even in normal, standardised populations there is large variability in performance across tests, and so this technique fails to consider psychometric issues regarding regression to the mean.

Hold tests are used to measure abilities that are thought to be relatively resistant to cognitive decline. The most prominent and widely measured ability is word reading ability (e.g. NART; National Adult Reading Test, Nelson, 1982; WTAR; Wechsler Test of Adult Reading, Wechsler, 2001; and CCRT; Cambridge Contextual Reading Test, Beardsall, 1998). Word reading ability has long been hypothesised to remain intact in the presence of dementia, particularly in Alzheimer’s disease (AD) (e.g. Barona et al., 1984; Yuspeh & Vandenploeg, 2000). This method has been critiqued in terms of its theoretical underpinning. The hypothesis that a *single* measure of ability can accurately predict *global* premorbid ability has been criticised by researchers due to the significant variation in abilities across different domains that is found in normal populations (Lezak et al., 2012; Duff, Chelune & Dennett, 2011).

In an attempt to marry two techniques, demographic equations have also been combined with hold tests in order to predict premorbid functioning (e.g. Oklahoma Premorbid Intelligence Estimation; OPIE; Krull, Scott & Sherer, 1995; Crawford, Cochrane, Besson, Parker & Stewart, 1990). These have been found to predict 73% of variance; an increase on 66% for hold tests alone in normal populations (Crawford, Stewart, Parker et al., 1989). However, when tested in a clinical population, these formulas do not significantly increase the percentage of variance accounted for above hold tests alone (Bright, Jaldow & Kopelman, 2002).

Reviews and studies comparing different methods of premorbid estimation tend to recommend the use of demographic equations above the use of hold tests and best performance methods (Taylor, 1999; Schretlen, Buffington, Meyer & Pearlson, 2005; Griffin, Mindt, Rankin, Ritchie & Scott, 2002; Lezak et al., 2012; Reynolds, 1997). Despite this, hold tests - the NART in particular - are still routinely used in clinical practice and in research, and it is routinely considered the 'gold standard' in premorbid assessment.

O'Carroll, Mofoot, Ebmeier, & Goodwin (1992) recommend that any measure of premorbid functioning should fulfil three criteria. It should 1) be highly correlated with current ability when tested in a healthy population; 2) be resistant to cognitive decline, i.e. performance should not be affected by the presence of dementia; and 3) have high inter-rater reliability.

The NART has been widely researched with regard to the first two criteria. For example, Dykiert and Deary (In Press) retrospectively validated the NART on the first criteria as part of the Lothian Birth Cohort 1936 studies. They found that current NART score in a

healthy aging population correlated highly ($r=.66-68$) with childhood ability (measured more than 70 years previously). This bypassed a common methodological problem for studies by having a comparative measure of ability before the onset of age-related cognitive decline. However, some studies have examined this further and identified that NART correlates more highly with some aspects of functioning than others. For example, Schretlen et al. (2005) found that whilst NART was significantly correlated with current verbal and full-scale IQ (Intelligence Quotient) it was less strongly correlated with other cognitive domains such as visual memory. This may be problematic when diagnosing dementia, as cognitive screening measures (e.g. MMSE; Mini-Mental State Examination, Folstein; Folstein & McHugh, 1975; ACE-R; Addenbrookes Cognitive Examination – R; Mioshi, Dawson, Mitchell, Arnold, & Hodges, 2006) tend to tap into current global cognitive ability (e.g thinking abilities such as memory and processing speed) rather than current IQ (intellectual performance). This means that clinicians may be attempting to establish deterioration in function by comparing current cognitive ability to premorbid IQ, which, whilst related, are not the same thing. This may lead to over or under-estimation of impairment.

With regard to O'Carroll et al's., (1992) second criteria (resistance to cognitive decline), the NART has had mixed results. For example Sharpe and O'Carroll (1991) found that performance on the NART was relatively unimpaired in dementia patients, and McGurn et al. (2004) found that NART performance was stable over time, even in individuals who went on to develop dementia. In contrast, O'Carroll et al. (1995) found that the NART underestimated premorbid ability in patients with dementia, particularly in those who were more severely impaired. Similarly, McFarlane, Welch & Rogers (2006) found that the NART

was poor at estimating premorbid ability in patients with AD who scored within the mild-moderate range of impairment on the MMSE.

These findings suggest that the NART may not be as robust as commonly thought, particularly when considered in terms of O'Carroll et al's. (1992) recommended criteria for measures of premorbid ability. One further problem with tests of word-reading ability, and with the NART in particular, has also been identified; it's poor reliability amongst patients with language disturbance. Given that the NART is a word-reading task, it would be logical to expect that performance would be affected in patients for whom language disturbance is present e.g progressive aphasia, semantic dementia or variants of AD (Taylor, 1999; Lezak et al., 2012). This has been shown to be the case for patients with Korsakoff's syndrome (O'Carroll et al., 1992). It is therefore likely to be unsuitable for use in all dementia populations.

An alternative measure of premorbid ability

The concept of Cognitive Reserve was developed to account for individual differences in the impact of neuropathology on cognitive impairment; why some individuals cope better with the same level of pathology than others (e.g. Stern, 2009). For example, Katzman et al. (1988) found that some individuals had pathological changes associated with AD (identified post-mortem) but without any cognitive impairment. They accounted for this by the individuals' higher brain weight, indicative of larger brains and greater 'brain reserve'. Cognitive reserve expands on this and considers the importance of other potentially protective factors affecting neural plasticity such as engagement in intellectually stimulating activities. Cognitive reserve has also been identified as an important factor to take into

account when diagnosing dementia (Stern, 2009). For example, for individuals with high cognitive reserve but with performance on cognitive tests within the normal or low average range, this may be associated with large pathological changes and so should be interpreted cautiously.

Measuring the amount of cognitive reserve an individual has accumulated throughout their life may therefore be relevant to the estimation of premorbid ability. Nucci, Mapelli & Mondini (2011) attempted to do this by developing the CRIq (Cognitive Reserve Index Questionnaire; Nucci, Mapelli & Mondini, 2011). This is a self or other report questionnaire that combines demographic information regarding lifelong 1) Education 2) Working activity and 3) Leisure time in an attempt to quantify the amount of cognitive reserve an individual has accumulated over their life. In its current form, the CRIq calculates this based on the amount of education and training completed throughout an individuals' lifetime, up to the present day. The Working Activity and Leisure Time components are calculated based upon engagement in these activities as an adult (age 18-present). Nucci et al. (2011) argue that the three most important and well-researched areas of CR are related to 1) education and training, 2) the degree of intellectual stimulation and personal responsibility that is/was required occupationally, and 3) participation in cognitively stimulating activities. They therefore included these three aspects of cognitive reserve in their questionnaire. In order to rule out any effects of age, three linear models were developed, transposed and standardised (with a mean of 100, s.d.³ 15) so that individuals of different ages could be compared. In a validation study of the CRIq, these three components

³ S.d.= Standard deviation

of cognitive reserve were found to correlate only moderately with each other (ranging from $r=.30$ to $.44$; Nucci et al., 2011), but highly with overall score ($r=.72$ to $.78$) highlighting their individual contribution to the overall CRIq score. In addition, performance on the CRIq was found to correlate only moderately with IQ ($r=.45$), as measured by the WAIS-R Vocabulary (Italian version of the Wechsler Adult Intelligence Scale - Revised; Orsini & Laicardi, 1997) and the TIB (Test di Intelligenza Breve; Colombo, Sartori & Stima, 2002) which is a reading test similar to the NART. The authors (Nucci et al., 2011) therefore argue that CR and IQ are two different constructs; with measures such as NART and WAIS reflecting “intellectual performance” (Nucci et al., 2011, pg 14), and the CRIq reflecting “the potential cognitive capability acquired throughout life” (Nucci et al., 2011, pg 14).

Whilst the NART has been found to correlate highly with premorbid verbal IQ, CRIq appears to have the potential to capture alternative aspects of premorbid global cognitive functioning. If this is the case, this may provide clinicians with a tool that:

- Does not rely on word reading ability. This may be particularly useful in patients with language disturbance;
- Takes into account aspects of global cognitive functioning (particularly premorbid non-verbal ability) rather than only premorbid verbal ability;
- Can be completed by a caregiver or someone who knows that individual well, eliminating the need to administer a test directly with the patient. This may have two benefits; 1) reducing potential distress associated with completing

neuropsychological tests for the patient, and 2) performance is likely to be unaffected by the severity of dementia;

- Can be used as a complimentary measure to NART, by capturing non-verbal premorbid ability as well as verbal premorbid ability. This may provide a more global, comprehensive assessment of premorbid functioning if used together;
- Is not affected by the presence of dementia: If the CRIq was completed based on demographic information up to the point of symptom onset, this would provide further resistance to cognitive decline. If the CRIq were to be based on information that pre-dated the onset of dementia, this would ensure that performance was not affected by dementia. However, this would be an amendment to the current administration of the CRIq.

In summary, estimating premorbid ability is a crucial part of diagnosing dementia. Numerous methods for this have been proposed, however, the NART remains the most commonly used. Several methodological limitations of the NART have been identified; reliance on a single ability to represent global ability (Reynolds, 1997), lack of resistance to cognitive decline (O'Carroll et al., 1995; McFarlane et al., 2006); poor correlation with non-verbal abilities (Schretlen et al., 2005); and poor reliability in patients with language disturbance (Taylor, 1999; Lezak et al., 2012). Cognitive Reserve (CR) is an alternative concept that may be relevant to estimating premorbid ability. By measuring the amount of

CR that has been accrued by an individual, this could be compared to current performance to estimate whether any change in cognitive ability has occurred.

5.1.1 Study aims and research questions

This pilot study aims to evaluate how a new measure of CR, the CRIq, is feasible as a measure of premorbid functioning by evaluating it against two of O'Carroll et al's. (1992) criteria. An additional aim is to assess how CRIq performance compares to performance on the NART. The following research questions will be addressed:

1) Does CRIq capture current non-verbal ability in a healthy population?

This will be examined by investigating how CRIq performance relates to performance on a measure of current non-verbal ability (WAIS-IV PRI; Wechsler Adult Intelligence Scale – Fourth Edition, Perceptual Reasoning Index, Wechsler, 2008) in a healthy control group;

2) Is performance on the CRIq affected by cognitive decline?

This will be examined by investigating whether performance on the CRIq differs between a patient group and a control group, whilst controlling for potential confounders such as education and mood (scores on a depression scale);

3) Is performance on CRIq related to performance on the NART?

As the NART is so well researched and is considered the 'gold-standard' measure of premorbid functioning, the two measures will be compared in order to examine whether CRIq performance is related to NART performance.

5.2 Method

5.2.1 Design

This study was quantitative, with both within-subjects and between-subject design elements. Favourable ethical opinion was provided by the local National Health Service Research Ethics Committee (South East Scotland Research Ethics Committee 2; see Appendices B1, B2, C1 and C2). Power analysis was completed in relation to each research question. All power calculations were based upon parameters recommended by Cohen (1992), namely that power for any study should be 0.8 with a standard α level of 0.05:

1) Does CRIq capture current non-verbal ability in a healthy population?

Power calculation for this research question was considered based upon the available evidence for the existence of a relationship between performance on the CRIq and non-verbal ability (WAIS-IV PRI). There is little direct evidence available from studies examining the CRIq, as the one known study to date (Nucci et al., 2011) only examined the relationship between CRIq performance and verbal ability, finding a moderate correlation ($r = 0.42--0.45$). Not surprisingly, the strongest association was found between CRI Education and verbal ability ($r = .44$ and $r = .43$, as measured by the TIB and the Vocabulary subtest of the Italian version of the WAIS). As the CRIq is heavily based upon education, other studies examining the link between education and non-verbal ability provide some evidence for an association. For example, Williams (1992) found that race, gender, education and occupation accounted for 21% variance in global memory performance. However, it is difficult to partial out the effect of education from other demographic variables. One study

that was able to partial out the individual effect of education found a small effect on non-verbal ability (Hilsabeck et al., 2009, found $r = .21$ between education and performance on 'Anagram Solutions'). In contrast, numerous studies consider education to be a vital part of understanding or estimating intelligence and cognitive ability (e.g. Crawford & Allen, 1997). Given this variation in findings of previous studies, there appears to be little rationale for assuming a particularly small or large effect size, and so a medium effect size was assumed. Based on these parameters a sample size of $N=64$ for the control group was required for performance on two measures to be compared.

2) Is performance on the CRIq affected by cognitive decline?

As with the previous research question there was little rationale upon which to base an assumption of effect size given that CRIq has not previously been used with a clinical group. However, in this instance the power calculation is made in an attempt to establish that there is no effect of cognitive decline on CRIq performance. Using a default medium effect size, a sample size of $N= 64$ per group was required in order to indicate an 80% probability that there was not a medium effect of cognitive decline on CRIq performance.

3) Is performance on CRIq related to performance on the NART?

As with the previous two research questions, the effect size calculation was based upon previous studies examining the link between performance on the NART and performance on the CRIq. Nucci et al (2011) found that CRIq was moderately correlated ($r = -.45$) with TIB errors (an Italian version of the NART). Given that CRIq is heavily weighted upon education, other studies examining a link between NART and Education are relevant here. Such studies

have found a large effect size. For example, Taylor (1999) found $r = .61$ between years of education and NART estimated IQ in patients with established dementia. These findings provide support for assuming a large effect size. Based on these parameters a sample size of $N=28$ per group was required in order to detect a significant correlation between the two measures.

Based upon the above parameters, and using the most conservative estimate of effect size, a sample size of $N = 64$ per group was required in order to address the research questions. However, difficulty with recruitment meant that this was not achieved, resulting in $N=13$ in the patient group and $N=20$ in the control group.

5.2.2 Participants

Patient group

The patient group comprised of 13 individuals with dementia. Eligibility criteria for the patient group were that participants a) had a diagnosis of dementia given by a Consultant Psychiatrist, further specified as either AD ($N= 10$) or mixed AD and vascular dementia ($N= 3$), b) were aged over 60 years, c) the diagnosis was given within the past two months to four years (mean time since diagnosis 17.92 months, s.d 15.68), d) symptom onset was at least one year prior to testing (mean 54.00 months, s.d 43.17), and e) scored below the clinical cut off for AD or mixed dementia ($< \text{or equal to } 17/30$) on the MOCA (mean 13.25, s.d 5.43). Exclusion criteria comprised the following; a) a diagnosis of dementia other than AD or mixed dementia, b) presence of any other neurodegenerative condition (e.g. Parkinson's disease), c) current or previous psychiatric illness, d) current or previous alcohol

or substance misuse, e) inability to provide written and verbal consent, as defined by referring clinician (e.g Psychiatrist), f) below 60 years of age, and g) did not speak English as a first language. Medication status was variable; one participant was not taking any medication for dementia, whilst N=12 were on a stable dose of anticholinesterase inhibitor including donepezil (N=7), memantine (N=3) and glantamine (N=2). All participants gave verbal and written informed consent.

With regard to demographic characteristics of this group, the mean age of the patient group was 82.77 (s.d 4.76), mean years of education was 11.62 (s.d 3.59) and the male: female ratio was 6:7. All were retired, and N=12 were right handed. GAI (Geriatric Anxiety Inventory; Pachana et al., 2007) and GDS-15 (Geriatric Depression Scale-15; Sheikh & Yesavage, 1986) scores were all within normal ranges (GAI mean 1.69, s.d 2.90; GDS mean 2.38, s.d 2.33).

Control group

The control group comprised of N=20 healthy older adults. Eligibility for control participants were a) absence of cognitive impairment, evidenced by group mean performance (26.75, s.d 2.17) within the 'normal' range on the MOCA (26 or above/30), and all individuals performing over the cut off point for MCI (<21/30), in line with established norms for the MOCA (Nasreddine et al., 2005) b) aged 60 or above, and c) spoke English as their first language. Exclusion criteria comprised the following; a) presence of any neurodegenerative condition (e.g. Parkinson's disease), b) current or previous psychiatric illness, c) current or previous alcohol or substance misuse, and d) previous brain injury e.g. stroke, tumour, traumatic brain injury.

With regard to the demographic characteristics of the control group, mean age was 70.20 years (s.d 5.93), mean years of education were 13.15 (s.d. 3.62), the male: female ratio was 3:17, all were right handed, and all were retired. GAI and GDS scores were all within normal ranges (mean GAI 1.55, s.d 2.31, and mean GDS 1.55, s.d. 1.90).

5.2.3 Materials

Assessments were conducted by an appropriately trained clinician, who was aware of the research aims. Participants completed a battery including the following tests:

Tests of premorbid ability

The National Adult Reading Test (NART; Nelson, 1982) was used with all participants to estimate premorbid cognitive functioning based on word reading ability, and has been validated against the Wechsler Adult Intelligence Scale – Revised (WAIS-R; Wechsler, 1981) . Participants are required to read aloud 50 irregular words. It is quick to administer and frequently used with an older adult population (e.g Schretlen et al., 2005). The NART has been established as a reliable and valid measure of premorbid intelligence in older adult populations, as discussed previously (e.g. Sharpe & O’Carroll, 1991).

The Cognitive Reserve Index Questionnaire (CRIq; Nucci et al., 2011) was used with all participants to estimate premorbid ability based on self or carer-reported education, working activity and leisure activity. The CRIq aims to quantify the amount of cognitive reserve accumulated throughout an individual’s lifetime by focusing on these three areas of

functioning. It has recently been standardised in a sample of 558 individuals aged of 18-102 (Nucci et al., 2011), but has yet to be used with a clinical sample or an English speaking sample. It has recently been translated into English by the authors.

Mood measures

The Geriatric Depression Scale- Short (GDS-15) was used with all participants to measure symptoms of low mood and depression. It was specifically developed for, and validated in, the older adult population (Sheikh & Yesavage, 1986). The GDS-15 has also been found to have good specificity and sensitivity in a meta-analysis of 42 studies (Wancata et al., 2006). This indicates that it can be reliably used as a screening measure for depression in later life. The Geriatric Anxiety Inventory (GAI; Pachana et al., 2007), was used to measure anxiety. It is reported to have good psychometric properties, with excellent inter-rater reliability, and was designed for use with older adults.

Cognitive screening measure

The Montreal Cognitive Assessment (MOCA; Nasreddine et al., 2005) was used with all participants as a brief cognitive screening tool. It has been shown to be more sensitive than MMSE in detecting mild cognitive impairment, AD and Vascular dementia in an elderly population, using a cut-off point of <21 for MCI and <17 for Vascular Dementia (Freitas, Simoes, Alves et al., 2012), and AD (Freitas, Simoes, Maroco et al., 2012).

Measure of current intellectual ability

The control group completed the three subtests comprising the Perceptual Reasoning Index (PRI) of the WAIS-IV. This was used to assess current non-verbal ability. The PRI is calculated based on performance on Block Design, Matrix Reasoning and Visual Puzzles. The WAIS-IV is a well validated measure of current ability, frequently used for this purpose in an older adult population (e.g Baxendale, 2011). Only the control group completed this measure as only they were required to complete an assessment of current intellectual functioning (non-verbal ability) in order to address research question 1). Completing this measure with the patient group would have increased administration time to over 90 minutes and was likely to result in unnecessary fatigue.

5.2.4 Procedures

Recruitment of patient group

Patients with dementia were recruited through several routes; through the Scottish Dementia Clinical Research Network (SDCRN) and through local NHS Older Adult Memory services (this includes Memory Clinics and Community Mental Health Services, who provide a Community Psychiatric Nursing (CPN) service for patients with dementia). The SDCRN aims to “improve the quantity and quality of dementia research in Scotland” (<http://www.sdcrn.org.uk/about-us/what-we-do>) and has a participant register of individuals with a diagnosis of dementia and their carers who are interested in participating in clinical research.

Prospective members are screened by an SDCRN clinician, who assesses cognitive ability and capacity to consent to participate in research. Researchers can apply for their study to be 'adopted' by the SDCRN, thus granting them access to an agreed number of participants meeting inclusion criteria. The SDCRN database was searched for individuals meeting the inclusion criteria, including ability to provide written informed consent. A total of 46 SDCRN patients were identified and invited to participate, with four responses. Upon checking of inclusion criteria, two were removed from the study, leaving two participants recruited through the SDCRN.

NHS clinicians (including Consultant Psychiatrists, Community Psychiatric Nurses and Clinical Neuropsychologists) identified potential patients on their caseload that met inclusion criteria, and whom they believed would be able to provide informed written consent to participate in the study (N=46). These patients were invited to participate in the study, of which 12 expressed an interest. Upon further checking of the inclusion criteria, one patient was excluded, leaving 11 recruited from NHS clinics. In total, 88 patients were identified, all of which were invited to participate, resulting in N=13 taking part. Uptake from the initial screening of potential participants was therefore 14.77%.

Recruitment of control group

Control participants were recruited through the SDCRN carer's register and through a local community group. A total of N=40 SDCRN carers were identified as meeting inclusion criteria and were invited to participate in the study, with four responding to the invitation and going on to participate. Members of the community group were invited by the primary

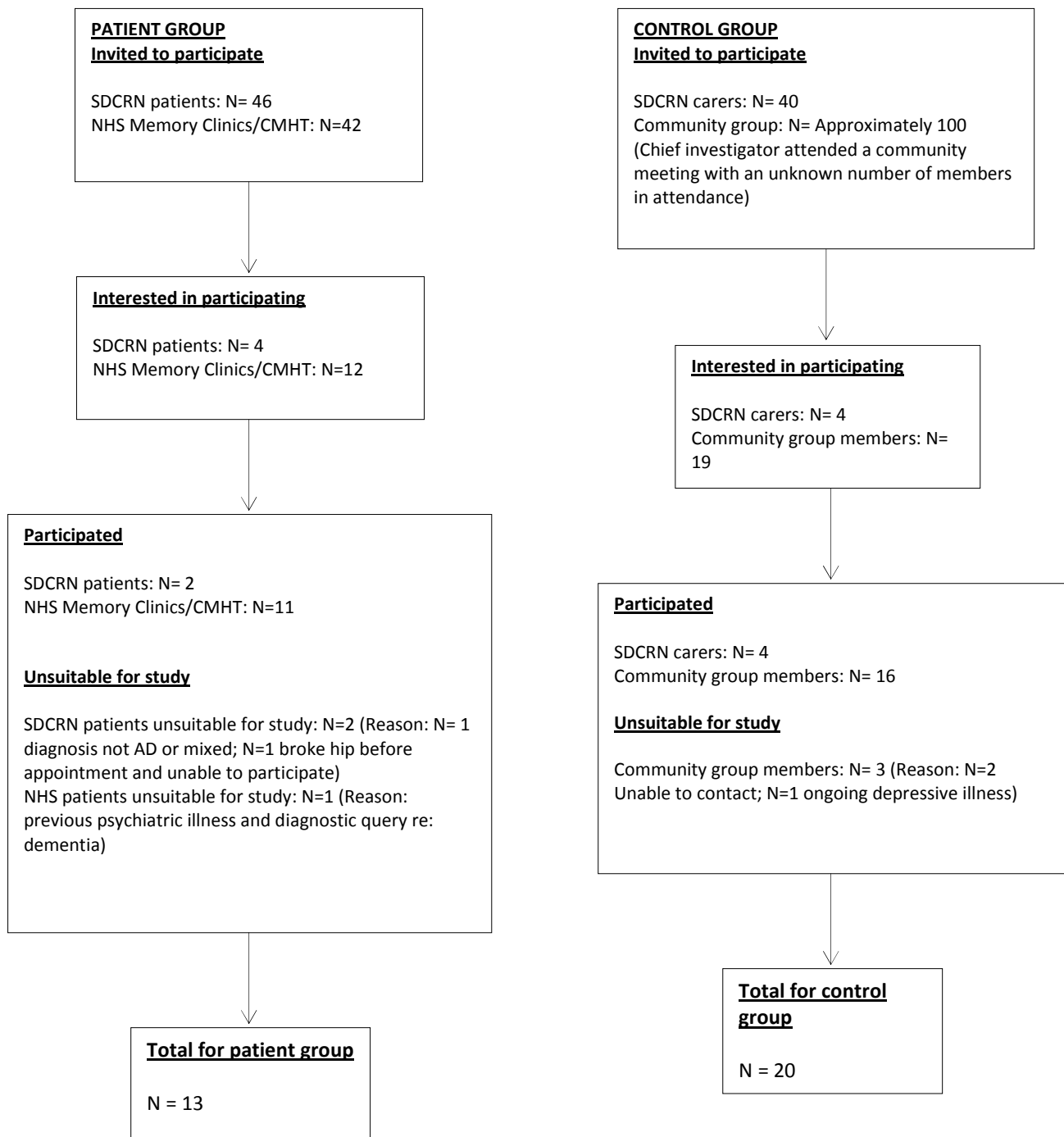


Fig 1. Recruitment pathway for all participants

researcher attending a monthly meeting, at which were approximately 100 members. N=19 members responded to this invitation, with three excluded due to not meeting inclusion criteria. A total of N=16 community group members therefore participated. This recruitment pathway is outlined in Fig 1. This means that at least N=140 individuals were invited to participate, with N=20 taking part, yielding an approximate uptake of 14.29%.

Assessment procedure

Participants were assessed either in a hospital clinic or in their own homes (where appropriate). Participants in the patient group gave written informed consent and received an assessment lasting approximately one hour (ranging from 45 minutes to two hours). The assessment consisted of; GDS, GAI, NART, CRIq, MOCA. Participants in the control group gave written informed consent and received an assessment lasting approximately 90 minutes (ranging from one hour to 2.5 hours). The assessment was as per the patient group, with the addition of three Perceptual Reasoning subtests from the WAIS-IV.

5.2.5 Analysis

Descriptive statistics were used to define each group. Parametric tests were used as even though there was relatively low N, the data was still able to meet the assumptions of parametric data (e.g normal distribution, homogeneity of variance). Group differences for demographic variables (i.e. age, education) were examined using multiple independent t-tests. Planned analyses were completed in relation to the three research questions:

1. Does CRIq capture current non-verbal ability in healthy adults?

This question was addressed using multiple paired-samples t-tests and correlational analysis to examine mean differences in CRIq and NART predicted premorbid ability scores and obtained a) current non-verbal ability (WAIS-IV PRI) and b) current global cognitive ability scores (MOCA) for the control group.

2. Is CRIq performance affected by cognitive decline?

This research question was examined using ANCOVA (Analysis of Covariance) by comparing mean score on CRIq and NART between groups, with any demographic variables that were significantly different between groups added as covariates in order to control for their effect on CRIq and NART performance.

3. Does performance on CRIq relate to performance on NART?

This was addressed by using paired t-tests and correlations to compare mean scores on NART and CRIq for each group.

5.3 Results

Data integrity and distribution

There was no missing data for any of the 20 control group participants. One participant in the patient group was unable to complete the MOCA due to fatigue, and so this was coded as missing data. All data was visually screened to identify outliers. Normality was examined

using the Shapiro-Wilk Test at $p > 0.05$ (as recommended by Field, 2005, for samples sizes < 50). This indicated that the assumption of normality was not violated. Homogeneity of variance was examined for all statistical tests using Levene's test for equality of variances, for which the majority of results were $p > 0.05$, and so equal variances were assumed. Whenever $p < 0.05$, equal variances were not assumed, and so corrected results are reported instead.

Data analysis

Descriptive statistics were used to define each group and Independent Samples T-tests were used to identify any differences between group means (control group Vs. patient group) for demographic variables and MOCA performance. This is summarised in Table 1 and shows that the control group were significantly younger (control: 70.20, s.d 5.92 Vs. patient: 82.77, s.d 4.76) ($t = 6.409$, $df = 31$, $p = .000$) than the patient group. Results also show that the control group performed significantly better on the MOCA than the patient group (control: 26.75, s.d 2.17 Vs. patient: 13.25, s.d 5.43) ($t = -8.227$, $df = 13.147$, $p = .000$), confirming that the patient group were cognitively impaired. The control group's mean performance on the MOCA (26.75, s.d 2.17) is in line with older adult norms (e.g Nasreddine et al., 2005).

*Table 1. Descriptive statistics: Group mean performance across demographic variables, with those that differ significantly between groups identified by **

Variable	Control group mean and s.d (N= 20)	Patient group means and s.d (N= 13)	t	df	p
Age (years)	70.20 (5.92)	82.77 (4.76)	6.41	31	.000**
Years of Education	13.15 (3.61)	11.62 (3.59)	-1.19	31	.242ns
Age at retirement	60.40 (4.62)	62.77 (8.55)	1.03	31	.309ns
GAI score	1.55 (2.30)	1.69 (2.90)	.16	31	.877ns
GDS score	1.55 (1.90)	2.38 (2.32)	1.13	31	.269ns
MOCA score	26.75 (2.17)	13.25 (5.43)	-8.23	13.147	.000**
WAIS-IV PRI [^]	101.80 (11.33)	-	-	-	-

Notes: No Missing data. GAI = Geriatric Anxiety Inventory; GDS = Geriatric Depression Scale; MOCA = Montreal Cognitive Assessment; WAIS-IV PRI = Wechsler Adult Intelligence Scale, Perceptual Reasoning Index. Ns = Not significant *p<0.05, **p<0.01 [^]this test (WAIS-IV PRI) was only completed by the control group.

5.3.1 Research question 1: Does CRIq capture current non-verbal ability in healthy controls?

a) Does CRIq capture current non-verbal intellectual functioning in healthy controls? (WAIS-IV PRI)

This research question was addressed by examining whether predicted ability according to CRIq subscores and NART estimated FSIQ was significantly different from actual performance on WAIS-IV PRI for the control group. NART estimated FSIQ was included so that CRIq and NART results could be compared throughout the analyses. As both of these measures are reported as equivalent IQ scores, mean performance could be directly compared with obtained WAIS-IV PRI IQ scores. Multiple paired-samples t-tests were conducted between WAIS-IV PRI score and NART estimated FSIQ, CRIq Total score, plus CRIq subscores; CRIq Education, CRIq Working Activity and CRIq Leisure Activity.

Pearson's correlation between these variables was also examined. Table 2 shows that, for the control group, WAIS-IV PRI mean score was significantly different from mean score on NART estimated FSIQ ($t = 6.26$, $df = 19$, $p = .000$, two tailed), CRIq Total score ($t = 7.73$, $df = 19$, $p = .000$), CRIq Education ($t = -6.28$, $df = 19$, $p = .000$), and CRIq Leisure Activity ($t = -8.66$, $df = 19$, $p = .000$). Only CRIq Working Activity and WAIS-IV PRI were not significantly different ($t = -1.92$, $df = 19$, $p = .070$, ns). This shows that CRIq Total, CRIq Education, CRIq Leisure Activity and NART estimated FSIQ over-estimated performance in comparison to obtained scores on WAIS-IV PRI. Correlational analysis was also completed and showed a significant correlation between CRIq Total and WAIS-IV PRI ($r = .52$, $p = .018$) between CRIq Education and WAIS-IV PRI ($r = .59$, $p = .018$) and between NART and WAIS-IV PRI ($r = .59$, $p = .006$).

Table 2. Research question 1: Paired t-tests and correlations for performance on CRIq, NART and WAIS-IV PRI for the control group

	Vs. WAIS-IV PRI M = 101.80 (11.33)			
	<i>t</i>	<i>P</i>	<i>df</i>	<i>r</i>
CRIq Total M = 125.70 (15.81)	7.73	=.000*	19	.52*
CRIq Education M = 117.35 (12.99)	-6.28	=.000*	19	.59*
CRIq Working Activity M = 108.35 (15.81)	-1.92	=.070ns	19	.41ns
CRIq Leisure activity M = 132.70 (15.16)	-8.66	=.000*	19	.30ns
NART estimated FSIQ M [^] = 114.95 (8.82)	6.26	= .000*	19	.59*

Notes: CRIq = Cognitive Reserve Index Questionnaire; WAIS-IV PRI = Wechsler Adult Intelligence Scale, Perceptual Reasoning Index; NART = National Adult Reading Test. Ns = Not significant * significant at $p < 0.05$, ^ NART estimated FSIQ is based upon norms for WAIS-R.

b) Does CRIq capture current global functioning in healthy controls? (MOCA)

This research question was addressed by examining the correlation between MOCA and CRIq subscores, NART estimated FSIQ and WAIS-IV PRI for the control group. Results indicated that none of these measures were significantly correlated with MOCA performance (see Table 3).

5.3.2 Research question 2: Is CRIq performance affected by cognitive decline?

In order to examine whether performance on CRIq was affected by cognitive decline, mean CRIq predicted premorbid ability was compared between groups. This was examined using

Table 3. Research question 1: Correlations for performance on CRIq, NART and MOCA for the control group

	MOCA M = 101.80 (11.33)
	<i>r</i>
CRIq Total M = 125.70 (15.81)	.18 ns
CRIq Education M = 117.35 (12.99)	-.004ns
CRIq Working Activity M = 108.35 (15.81)	.31 ns
CRIq Leisure activity M = 132.70 (15.16)	.11ns
NART estimated FSIQ M^= 114.95 (8.82)	.04ns
WAIS-IV PRI M = 101.80 (11.33)	.03ns

Notes: CRIq = Cognitive Reserve Index Questionnaire; MOCA = Montreal Cognitive Assessment; NART = National Adult Reading Test; WAIS-IV PRI = Wechsler Adult Intelligence Scale, Perceptual Reasoning Index. Ns = Not significant, ^ NART estimated FSIQ is based upon norms for WAIS-R.

ANCOVA with CRIq and NART estimated FSIQ performance as the dependent variables and group (Control group Vs. patient group) as the independent variable. As the groups were

found to differ significantly in terms of age this variable was added as a covariate in order to control for its possible confounding effects. In addition, years of education and GDS (mood) score were added as covariates in order to control for their effect on performance on CRIq and NART estimated FSIQ. These variables were added despite the lack of group difference in scores, as they are both important variables to consider when assessing premorbid ability. Results showed that after controlling for age, education and GDS score there was a significant effect of Group on NART performance ($F(2, 28) = 6.120, p = .020$), partial $\eta^2 = .179$, but not for CRIq Total score ($F(2, 28) = 0.143, p = .708$), partial $\eta^2 = .005$, see Table 4. This showed that after controlling for differences in age, education level, and mood (GDS score), CRIq performance was not affected by cognitive decline (with a weak ES of group), whereas NART performance was affected by cognitive decline (with a modest ES of group).

Table 4. Performance on NART and CRIq by each group and ANCOVA result after controlling for age, education, and mood (depression).

Variable	Control group mean and s.d (N= 20)	Patient group means and s.d (N= 8)	F	df	p	η^2
CRIq Total	125.70 (15.82)	120.77 (18.06)	.14	1, 30	.708ns	.01
NART estimated FSIQ^	114.95 (8.82)	101.15 (11.92)	6.12	1, 30	.020*	.18

Notes: No Missing data. NART = National Adult Reading Test; CRIq = Cognitive Reserve Index Questionnaire; Ns = Not significant, * $p < 0.05$, ** $p < 0.01$, ^ NART estimated FSIQ is based upon norms for WAIS-R.

5.3.3. Research question 3: Does performance on CRIq relate to performance on NART?

In order to understand whether CRIq performance was related to NART estimated FSIQ performance, i.e. if they predict a similar pattern of premorbid ability, multiple paired t-tests and correlations were used to compare mean score on NART estimated FSIQ and CRIq Total and CRIq subtests for each group.

Control group

Results for the control group indicate that NART predicted premorbid ability was significantly lower than predicted premorbid ability according to CRIq Total (mean 114.95, s.d 8.82 Vs. mean 125.70, s.d 15.81) ($t = -3.79$, $df = 19$, $p = .001$) and CRIq Leisure Activity (mean 114.95, s.d 8.82 Vs. mean 132.70, s.d 15.16) ($t = -4.92$, $df = 19$, $p = .026$). However, NART predicted premorbid ability was significantly higher than predicted premorbid CRIq Working Activity (mean 114.95, s.d 8.82 Vs. mean 108.35, s.d 15.81) ($t = 2.41$, $df = 19$, $p = .000$). Correlational analysis showed that there were significant correlations between NART estimated FSIQ and CRIq Total ($r = .60$, $p = .005$), between NART estimated FSIQ and CRIq Education ($r = .68$, $p = .001$) and between NART estimated FSIQ and CRIq Working Activity ($r = .64$, $p = .003$).

Table 5. Research question 3: The relationship between NART performance and CRIq performance for the control group

	Vs. NART estimated FSIQ M = 114.95 (8.82)			
	<i>t</i>	<i>df</i>	<i>p</i>	<i>r</i>
CRIq Total M = 125.70 (15.81)	-3.79	19	.001**	.60*
CRIq Education M = 117.35 (12.99)	-1.12	19	.276ns	.68**
CRIq Working Activity M = 108.35 (15.81)	2.41	19	.026*	.64**
CRIq Leisure activity M = 132.70 (15.16)	-4.92	19	.000**	.18ns

Notes: CRIq = Cognitive Reserve Index Questionnaire; NART = National Adult Reading Test.

Ns = Not significant * significant at $p < 0.05$, ** significant at $p < 0.01$

Patient group

Results for the patient group indicate that performance on NART estimated FSIQ was significantly lower than performance on CRIq Total (mean 101.15, s.d 11.92 Vs. mean 120.77, s.d 18.06) ($t = -3.810$, $df = 12$, $p = .001$), CRIq Education (mean 101.15, s.d 11.92 Vs. mean 116.62, s.d 13.63) ($t = -4.209$, $df = 12$, $p = .002$), and CRIq Leisure (mean 101.15, s.d 11.92 VS. mean 124.00, s.d 23.26) ($t = -3.567$, $df = 12$, $p = .004$). Correlational analyses indicated that there were no significant correlations between NART performance and CRIq Total or any of the CRIq subscore performances.

Table 6. Research question 3: The relationship between NART performance and CRIq performance for the patient group

	Vs. NART estimated FSIQ M =101.15 (11.92)			
	<i>t</i>	<i>df</i>	<i>p</i>	<i>r</i>
CRIq Total M = 120.77 (18.06)	-3.81	12	.002**	.29ns
CRIq Education M = 116.62 (13.63)	-4.21	12	.001**	.47ns
CRIq Working Activity M = 106.23 (15.72)	-.90	12	.387ns	-.07ns
CRIq Leisure activity M = 124.00 (18.06)	-3.57	12	.004**	.27ns

Notes: CRIq = Cognitive Reserve Index Questionnaire; NART = National Adult Reading Test.

Ns = Not significant * significant at $p < 0.05$, ** significant at $p < 0.01$

5.4 Discussion

The diagnosis of dementia requires clear evidence that a decline in cognitive functioning has taken place in comparison to premorbid ability (Lezak et al., 2012). Accurately establishing the level of premorbid ability can therefore enable more reliable diagnosis of dementia. As previously discussed, three main approaches to establishing premorbid ability have been developed; demographic equations (e.g. Barona, Chastain & Reynolds, 1984; Crawford & Allan, 1997), best performance indicators, and hold tests (e.g. NART, WTAR, CCRT). The most widely used technique in clinical practice and in research is the hold test method, most

commonly, the NART (e.g Starr & Lonie, 2007). This is despite numerous reviews concluding that demographic equations are the most valid and reliable method (Taylor, 1999; Schretlen, 2005; Buffington et al., 2005; Griffin et al., 2002; Lezak et al., 2012; Reynolds, 1997). O'Carroll et al. (1991) highlighted three criteria against which any measure of premorbid ability should be assessed; they should 1) be able to capture current ability in controls in order to establish validity, 2) be resistant to cognitive decline, and 3) have high inter-rater reliability. This current study sought to examine whether a measure originally developed to quantify cognitive reserve, the Cognitive Reserve Index Questionnaire (CRIq) can feasibly function as a measure of premorbid ability. As the CRIq had not been used in a UK sample or with a clinical population, this pilot study attempted to examine whether it meets the first two of O'Carroll et al's. (1991) criteria, in order to establish proof of concept.

O'Carroll et al's. (1991) first criteria focuses on the importance of premorbid measures proving their validity by accurately assessing current functioning in healthy controls. Results showed that CRIq had a large positive correlation with current non-verbal intelligence (WAIS-IV PRI) ($r = .52$ to $.59$), however, it significantly over-estimated ability compared to WAIS-IV performance. CRIq's overestimation of current non-verbal intelligence could be explained by the CRIq being normed on an Italian population, who may have different cultural norms to the Scottish population used in this study. Indeed, in the validation study of the CRIq, Nucci et al. (2011) found that the majority of older participants had only five years of education, whereas this study found that the control group had an average of 13.15 (s.d. 3.62) years of education, whilst the patient group had 11.62 (s.d 3.59). As 1/3 of the CRIq Total score is derived from years of education and training, this could

explain why the control group were predicted to be significantly more able than they actually were. Previous studies have also indicated that the CRIq is highly related to current ability in a healthy population (Nucci et al., 2011). It is not surprising therefore, that CRIq Education was highly related to WAIS-IV PRI as numerous studies have found intelligence and education to be highly related (e.g. Deary and Dykiert, In Press). However, the CRIq significantly over-estimated ability when compared to actual ability, which does not replicate Nucci et al's. (2011) finding. The CRIq is difficult to compare directly to other measures of premorbid ability, as it was not designed for this purpose, but instead attempts to capture lifelong cognitive reserve. However, the content of the measure (which is a composite of three subscores regarding lifelong education, working activity and leisure activity) is similar to the demographic equation technique. These tend to combine information regarding education and occupational history to predict premorbid ability (e.g. Barona et al., 1984, and Crawford & Allan., 1997). Previous studies examining the accuracy of demographic equations have shown that they can over estimate premorbid ability (e.g. Reynolds, 1997). The current finding is therefore in line with previous studies that have identified a similar problem with the use of demographic equations. However, this study is unable to establish whether the CRIq would be preferable to other equation techniques for estimating premorbid ability, due in part to the small sample size precluding the use of regression to analyse the individual capability of each measure to predict current functioning. Results also suggest that CRIq would require further adjustment (e.g. to be adapted using UK norms) before this type of comparison could be made. This would allow more in depth examination of whether the CRIq is able to make an independent and

significant contribution to the estimation of premorbid ability, over and above other methods.

A crucial finding of this study was that CRIq performance was not affected by the presence of dementia. This has not been addressed by any other study previously. Indeed, the original validation study of the CRIq (Nucci et al., 2011) did not include a clinical group, preventing direct comparison. In comparison with other demographic equations that predict premorbid ability, the CRIq is less reliant on current ability and so a) removes subjective interpretation of results and b) is less likely to be affected by cognitive decline (Reynolds, 1997). The finding that NART was affected by the presence of dementia supports previous research recommending the use of demographic equations over the use of hold tests for this population (e.g Taylor, 1999; Schretlen et al., 2005; Griffin et al., 2002; Lezak et al., 2012; Reynolds, 1997). However, the question of whether the CRIq was affected by cognitive decline could be overcome if the measure was completed based upon demographic information before the onset of dementia. This would mean that the CRIq was based upon information that pre-dated the onset of cognitive decline and so addresses O'Carroll's second criteria. In order to fully address this question, a longitudinal study would need to be conducted in order to establish that CRIq is resistant to cognitive decline over a period of time, rather than using a cross-sectional design.

An important finding of this study was that NART and CRIq performance were related for the control group, but not for the patient group. This finding is similar to Nucci et al. (2011) who found a moderate positive correlation between an Italian version of the NART, the TIB, and CRIq Total in healthy controls ($r = .45$). The difference between the NART

and the CRIq in the patient group is in line with past research that has shown that hold tests and demographic equations capture different aspects of premorbid ability. For example, Crawford et al. (1989) found that hold tests alone accounted for 66% variance in premorbid ability in normal populations, but that this increased to 73% when demographic equations were combined with hold test performance. This suggests that demographic equations tap into related, but separate aspects of premorbid ability to that of hold tests. This was hypothesised by Nucci et al. (2011) in their validation of the CRIq, and is supported by the results of this study.

The finding that NART performance and CRIq performance were unrelated for the dementia group can also be accounted for by NART being weak at resisting the effects of cognitive decline (e.g. O'Carroll et al., 1995; McFarlane et al., 2006). These findings can be explained by the NART being a verbal IQ 'performance' measure and so relies on word-reading ability being relatively spared in patients with dementia. This may be an unrealistic expectation given that dementia is characterised by degenerative cognitive impairment. The CRIq is less dependent on current performance and instead captures indicators of lifelong non-verbal ability as well as protective factors such as participation in intellectually demanding activities. It therefore appears that performance on NART and CRIq are related, but measure different characteristics and produce different estimates of premorbid ability in a patient group.

The NART as a measure of premorbid ability

This study has used the NART as an exemplar of a measure of premorbid ability. In terms of O'Carroll et al's. (1991) criteria, results indicated that NART performance: was moderately

correlated with performance on WAIS-IV PRI ($r = .59$), but not correlated with performance on the MOCA ($r = .04$) in healthy controls. This supports previous findings by Schretlen (2005) who found that NART was highly related to current intellectual ability, and Dykiert and Deary (In Press), who found that NART correlated with intellectual ability in healthy older adults $r = .66$ to $.68$. It also supports previous findings by Schretlen (2005) who found that NART was less related to other aspects of cognition e.g executive functioning, memory. The NART was found to be negatively affected by the presence of dementia. This supports previous research suggesting that the NART may be weak at resisting the effects of cognitive decline (e.g. O'Carroll et al., 1995; McFarlane et al., 2006).

5.4.1 Study limitations

This study replicated aspects of the original CRIq validation study (Nucci et al., 2011) by including a measure of current ability (WAIS-IV PRI) as well as a measure of word reading ability (NART), and an additional cognitive screening tool (MOCA). Whilst the MOCA is a well validated cognitive screening tool for use in clinical populations, our results appear to show ceiling effects within the control group. This lack of variance in scores allows little scope to test for correlations between NART and CRIq score and global cognitive ability (i.e. MOCA score), as opposed to nonverbal ability (which was measured by WAIS-IV). A more in-depth screening measure such as the ACE-R may have overcome this problem; however, the ACE-R was unable to be used at the time of data collection due to issues regarding copyright. Whilst the MOCA remains a valid screening tool for cognitive impairment, and was a useful means by which to ensure that the control group were cognitively unimpaired, it did not

allow for further investigation into the question of whether the CRIq captures global cognitive ability or only non-verbal ability. It may have been helpful to measure other aspects of cognition in the control group in order to compare premorbid verbal Vs. non-verbal ability more explicitly (e.g. non-verbal memory, executive functioning). This may have been able to better address how CRIq compares to NART at capturing specific domains of functioning in the control group, and provide better validation of the utility of the CRIq for specific clinical presentations. For example, measuring verbal ability using a well validated measure such as the Verbal Comprehension Index from the WAIS-IV may have allowed comparison between premorbid verbal Vs. non-verbal ability.

This study used a cross-sectional design to examine whether CRIq performance differed between a healthy control group and a cognitively impaired group. Whilst this is a common method by which premorbid measures are validated and tested (e.g. Duff, Chelune & Dennett, 2011; Schretlen et al., 2005), it is a less robust method compared to other techniques. A longitudinal study examining participants that either go on to develop dementia, or for whom their cognitive impairment worsens, would allow the CRIq to be fully evaluated against this criteria. In addition, the lack of matching between the control group and the clinical group may have exacerbated this design limitation.

Uptake for the control group and patient group from the initial stage of recruitment was 14.77% and 14.29% respectively. This is difficult to compare to previous research as many studies only report the final N recruited per group, not the number that were approached (e.g. Griffin et al., 2002; McFarlane et al., 2006; Hilsabeck & Sutker, 2009). Nevertheless, similar studies with small N's have been published in this field with an older

adult population, using similar statistical methods to analyse their data (e.g Law & O'Carroll, 1998, who had an AD group with N=21; Hilsabeck & Sutker, 2009, who had N=20 in their AD group and N=27 in their control group, and Lough et al., 2006, who had N=13 in their control group and N=18 in their fronto-temporal dementia group). The older adult population is notoriously difficult to recruit, and there are numerous challenges when trying to engage this population in research (for a discussion of these issues see Knechel, 2013). Nevertheless, this study was under-powered and so the results should be interpreted with caution. This is also likely to limit the generalisability of the results.

Several avenues of recruitment were pursued, including local community groups, NHS clinics and charitable organisations that support research into dementia. The control group was recruited through the Scottish Dementia Clinical Research Network (SDCRN) and a local community group. One reason for the low N was that the SDCRN were limited in the number of members they could provide details of, due to the high demand on the network for participants. In addition, the local community group were limited in how many times they could remind their members about the study, so as not to exert undue pressure to participate. The patient group were recruited through the SDCRN and NHS Lothian Older Adult services (e.g. memory clinics, CMHT's). It is unknown how many cases were considered at the initial stage of recruitment by clinicians, as they were only asked to identify those whom they believed met inclusion criteria. It is likely that had inclusion criteria been less stringent i.e had the study accepted individuals with co-morbidities, or variants of dementia other than AD and mixed dementia, more participants would have been identified and participated.

There are limitations to using an established database for research including; potential research fatigue, practice effects, and the possibility that those who register for research databases are not representative of the population as a whole. Recruiting from local community groups faces similar problems; they may not be a representative sample, and given their participation in the community group, they may not represent normal trends for participation in leisure activities. This is an important factor to consider as the majority of control group participants were recruited from the community group (16/20) and so this may have affected the control group's overall performance on the CRIq Leisure Activity score as well as the CRIq Total score. This therefore limits the generalisability of the study findings. However, this is a problem common for research into dementia (Knechel, 2013) and many studies do not identify how their control sample was recruited (e.g. Lowe & Rogers, 2011) or instead use carers as controls (e.g. McFarlane et al., 2006).

A final limitation of the study relates to the use of the NART as opposed to other 'hold' measures of premorbid functioning such as the WTAR or TOPF. Whilst the control group's current ability was assessed using the WAIS-IV, the NART is validated against the WAIS-R, possibly accounting for the NART's overestimation of FSIQ. This is because of factors such as the "Flynn Effect"; the purported increase in worldwide ability seen since IQ tests were first introduced in the 1930s. This means that were someone to complete both the WAIS-R and the WAIS-IV today, they would be likely to achieve a higher score on the WAIS-R than the WAIS-IV. This may explain why there were differences between obtained WAIS-IV PRI performance and predicted FSIQ based on NART. However, this limitation is less problematic when comparing control and patient groups on NART scores.

5.4.2 Future research

This study provides limited evidence to suggest that the CRIq may be a helpful tool to estimate premorbid ability for patients with dementia. Whilst it was under-powered, it demonstrates the importance of conducting pilot studies to examine the feasibility of research hypotheses. It also highlights the importance of funding for studies to enable recruitment of a large sample, allowing for the use of more sophisticated analyses including multiple regression. This would allow for a greater understanding of the CRIq's contribution to the assessment of premorbid ability, independent to other measures such as the NART or other demographic equations. Other measures of ability (e.g. different domains of cognition) could be used as a dependent variable, and examined in order to see whether CRIq has better predictive ability than the NART for cognitive domains other than verbal IQ. Further scope for future studies relates to the study design; the cross sectional nature of this study allowed for limited assessment of the CRIq's ability to resist cognitive decline over time. Future studies should consider a longitudinal design that evaluates change in cognition over time, allowing for a more robust examination of the CRIq's resistance to cognitive decline. In addition, better matching of control and clinical group participants would reduce any confounding effects of demographic variation on groups (e.g. age and education).

Performance on neuropsychological measures has been shown to be negatively affected by effort and fatigue in older adults with dementia (Bortnik, Horner, & Bachman, 2013). Because the CRIq can be completed by a carer, it is less performance-based and so may be less affected by patient effort and fatigue than alternative measures that are based

upon performance (e.g. NART, WTAR). Future studies could examine this further and assess how effort or fatigue affects performance on the CRIq compared to other measures.

Future studies could examine patients' experience of completing the CRIq in comparison to traditional neuropsychological measures. With national guidelines taking a person-centred approach to patient care (e.g NICE Clinical Guidelines CG42, 2006), patients' acceptability of assessment measures is an important consideration. Structured approaches to assessing patients' acceptability of procedures for the assessment of dementia have been undertaken (e.g Parikh et al., 2013). It is possible that completing the CRIq may be perceived by patients and clinicians as person-centred as it asks patients about their life experience. However, it may be less preferable for some patients as it takes longer to complete than measures such as NART. As mentioned previously, fatigue and effort may influence this experience (Bortnik et al., 2013). This could be examined in further detail to ensure that all aspects of dementia care; from assessment to post-diagnostic support, is focused on the individual and takes account of patients' needs and preferences.

Finally, the CRIq appears to over-estimate current ability in healthy controls. This is highly likely to be a reflection of the norms used for the calculation of the CRIq Total score and subscores, given that these were based on a population with far fewer years of education. Therefore, more appropriate norms should be developed for the UK population. Other assessments of premorbid ability have been widely re-normed for specific populations. For example, the NART has been validated in numerous languages e.g Swedish, (Rolstad et al., 2008), French (Mackinnon & Mulligan, 2005), as well as in different English-speaking countries such as the USA (Lowe & Rogers, 2011).

5.4.3 Clinical implications

Establishing whether deterioration has taken place in comparison to premorbid ability is often a key aim of neuropsychological assessment (Lezak et al., 2012). Tests of reading ability such as the NART and WTAR are the predominant methods by which premorbid ability is estimated in clinical practice. Such tests should be able to capture current ability when measured in controls, but also be resistant to the effects of cognitive decline so that they can reliably allow the detection of change when dementia is present (O'Carroll et al., 1991). There has been considerable evidence to suggest that traditional hold tests such as the NART are able to capture current verbal ability in healthy populations (e.g Dykiert & Deary, 2013), but struggle to remain valid when tested in patients with dementia (e.g Schretlen, 2005; McFarlane et al., 2006). This study supports these findings and so adds further weight to the argument that measures such as NART may not be a valid and reliable method by which to measure premorbid ability in individuals with established dementia (performing below the cut off point for dementia on MOCA; Freitas et al., 2012). This study found that CRIq significantly over-estimated current ability in controls and so was unable to meet O'Carroll et al's. (1991) first criteria. The finding that it was then resistant to cognitive decline is therefore redundant unless appropriate norms are developed for specific populations so that the CRIq is reliable and valid at capturing current ability. However, once this is completed, the CRIq may have clinical utility in the following areas:

The CRIq may be helpful to use alongside the NART in order to gain a more complete picture of premorbid ability. Whilst both measures were highly related to each other, there was still discrepancy between them, and so there is potential they measure

different aspects of premorbid ability. Again, this will be more definitive once the CRIq has developed norms for a UK population, and studies with larger samples have demonstrated the variance accounted for by each approach.

One population where CRIq may have particular clinical utility is with patients with language disturbance. The main diagnostic category relevant for this is the frontal dementias, particularly the primary progressive aphasia, which includes semantic dementia, progressive nonfluent aphasia (Mesulam, 2003), and logopenic aphasia (Gorno-Tempini et al., 2008). These dementias are characterised by word comprehension deficits, impaired articulation, and impaired speech repetition (Mesulam, 2003) and so such patients would clearly struggle to complete word reading tests such as the NART. Similarly, NART performance has been shown to be impaired in patients with Korsakoff's syndrome, who can present with poor comprehension and confabulation (O'Carroll et al., 1992). These presentations are all rarer types of dementia, however, language disturbance can also be found in AD, which constitutes roughly 60% of all dementias (NICE CG42, 2006). For these patients, inclusion of the CRIq in their assessment may allow for a more reliable assessment of their premorbid ability.

Complex assessment for dementia is often undertaken by Clinical Psychologists who are appropriately trained to administer, score and interpret neuropsychological measures. Administration of the CRIq is designed to be completed by an informant, carer or by the patient themselves, and so would not require complex training of clinicians in order for it to be administered. In addition, the use of the CRIq computation programme (Nucci et al.,

2011) means that this can be scored and interpreted easily and without the use of comparison to specific norms, as scores are converted to an age-adjust IQ equivalent.

5.5 Conclusions

This study demonstrated that the CRIq over-estimates premorbid ability in healthy controls and so would be likely to over-estimate impairment if used in its current form within a clinical setting. The development of norms appropriate for a UK population may overcome this problem, however, in its current form, the CRIq cannot be considered a valid and reliable measure of premorbid ability as it does not meet O'Carroll et al's. (1991) first criteria. Once this has been overcome, the CRIq has potential for use with populations where language disturbance is a feature of the clinical presentation. The study also provided further evidence against the clinical utility of the NART, by demonstrating that performance on the NART was negatively affected by the presence of dementia.

5.6 References

Baddeley, A., Emslie, H. & Nimmo-Smith, I. (1993). The Spot-the-Word Test: A robust estimate of verbal intelligence based on lexical decision. *British Journal of Clinical Psychology*, 32, 55- 65

Barona, A., Reynolds, C. R., & Chastain, R. (1984). A demographically based index of premorbid intelligence for the WAIS-R. *Journal of Consulting and Clinical Psychology*, 52, 885–887

Baxendale, S. (2011). IQ and Ability Across the Adult Life Span. *Applied Neuropsychology: Adult*, 18 (3),164-167

Beardsall, L. (1998). Development of the Cambridge Contextual Reading Test for improving the estimation of premorbid verbal intelligence in older persons with dementia. *British Journal of Clinical Psychology*, 37 (2), 229–240

Bortnik, K.E., Horner, M.D., & Bachman, D.L. (2013). Performance on Standard Indexes of Effort Among Patients With Dementia. *Applied Neuropsychology. Adult*, 20, 4, 233-242

Bright, P., Jaldow, E., & Kopelman, M.D. (2002). The National Adult Reading Test as a measure of premorbid intelligence: A comparison with estimates derived from demographic variables. *Journal of the International Neuropsychological Society*, 8, 847-854

Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112, 155-159

Colombo, L., Sartori, G., & Brivio, C. (2002). Stima del quoziente intellettivo tramite l'applicazione del TIB (test breve di Intelligenza). *Giornale Italiano di Psicologia*, 3, 613–637

Crawford, J. R., & Allan, K. M. (1997). Estimating premorbid WAIS-R IQ with demographic variables: regression equation derived from a UK sample. *The Clinical Neuropsychologist*, 11, 192–197

Crawford, J.R., Cochrane, R.H.B., Besson, J.A.O., Parker, D.M., & Stewart, L.E. (1990). Premorbid IQ estimates obtained by combining the NART and demographic variables: construct validity Person. *Individual Differences*, 11 (2), 209-210

Crawford, J.R., Stewart, L.E, Parker, D.M, et al. (1989). Estimation of premorbid intelligence: combining psychometrics and demographic approaches improves predictive accuracy. *Personality and individual differences*, 10, 793-796

Duff, K., Chelune, G.J., & Dennett, K. (2011). Predicting Estimates of Premorbid Memory Functioning: Validation in a Dementia Sample. *Archives of Clinical Neuropsychology*, 26, 701-705

Dykiert, D., & Deary, I.J. (In Press). Retrospective Validation of WTAR and NART Scores as Estimators of Prior Cognitive Ability Using the Lothian Birth Cohort 1936. *Psychological Assessment*, doi/10.1037/a0033623

Field, A. (2005). *Discovering Statistics Using SPSS (2nd ed)*. London: Sage

Folstein, M.F., Folstein, S.E., & McHugh, P.R. (1975). Mini-Mental State. A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*, 12(3), 189-98

Freitas, S., Simoes, M.R., Alves, L., Vicente, M., & Santana, I. (2012). Montreal Cognitive Assessment (MoCA): Validation Study for Vascular Dementia. *Journal of the International Neuropsychological Society*, 18 (6) 1031-1040

Freitas, S., Simoes, M.R., Maroco, J., Alves, L., & Santana, I. (2012). Construct Validity of the Montreal Cognitive Assessment (MoCA). *Journal of the Interventional Neuropsychological Society*, 18 (2), 242-250

Griffin, S.L., Mindt, M.R., Rankin, E.J., Ritchie, A.J., & Scott, J.G. (2002). Estimating premorbid intelligence and contemporary methods across the continuum. *Archives of Clinical Neuropsychology*, 17, 497-507

Gorno-Tempini, M.L, Brambati, S.M., Ginex, V., Ogar, J., Dronkers, N.F., Marcone, A., Perani, D., ... Miller, B.L. (2008). The logopenic/phonological variant of primary progressive aphasia. *Neurology*, 71, 1227–1234

Hilsabeck, R.C., & Sutker, P.B. (2009). Using an Implicit Memory Task to Estimate Premorbid Memory. *Archives of Clinical Neuropsychology*, 24, 179 - 191

Katzman, R., Terry, R., Deteresa, R et al. (1998). Clinical, pathological, and neurochemical changes in dementia: A subgroup with preserved mental status and numerous neocortical plaques. *Annals of Neurology*, 23, 138–144

Knechel, N.A. (2013). The Challenges of Enrolling Older Adults into Intervention Studies. *Yale Journal of Biology and Medicine*, 86, 41 - 47

Krull, K.R., Scott, J.G., & Sherer, M. (1995). Estimation of premorbid intelligence from combined performance and demographic variables. *The Clinical Neuropsychologist*, 9, 83-88

Law, R., & O'Carroll. (1998). A Comparison of Three Measures of Estimating Premorbid Intellectual Level in Dementia of the Alzheimer Type. *The international Journal of Geriatric Psychiatry*, 13, 727 – 720

Lezak, M.D., Howieson, D.B., Bigler, E.D., & Tranel, D. (2012). *Neuropsychological Assessment (5th ed)*. New York NY: Oxford University Press

Lough, S., Kipps, C.M., Treise, C., Watson, P., Blair, J.R., & Hodges, J.R. (2006). Social reasoning, emotion and empathy in frontotemporal dementia. *Neuropsychologia*, 44, 950 - 958

Lowe, D.A., & Rogers, S.A. (2011). Estimating Premorbid Intelligence among Older Adults: The Utility of the AMNART. *Journal of Aging Research*, doi:10.4061/2011/428132

MacFarlane, J., Welch, J., & Rodgers, J. (2006). Severity of Alzheimer's disease and effect on premorbid measures of intelligence. *British Journal of Clinical Psychology*, 45, 453-63

Mackinnon, A., & Mulligan, R. (2005). The estimation of premorbid intelligence levels in French speakers. *L'Encephale*, 31, 1, 1, 31 – 43 [Article in French]

McGurn, B., Starr, J.M., Topfer, J.A., Pattie, A., Whiteman, M.C., Lemmon, H.A., Whalley, L.J., & Deary, I.J. (2004). Pronunciation of irregular words is preserved in dementia, validating premorbid IQ estimation. *Neurology*, 62 (7), 1184-1186

Mesulam, M.M. (2003). Primary progressive aphasia—a language-based dementia. *The New England Journal of Medicine*, 349, 1535 – 1542

Mioshi, E., Dawson, K., Mitchell, J., Arnold, R., & Hodges JR. (2006). The Addenbrooke's Cognitive Examination Revised: a brief cognitive test battery for dementia screening. *International Journal of Geriatric Psychiatry*, 21, 1078–1085

Nasreddine, Z.S., Phillips, N.A., Bedirian, V., Charbonneau, S., Whitehead, V., Collin, I., Cummings, J.L., & Chertkow, H. (2005). Montreal Cognitive Assessment, MoCA: A Brief Screening Tool For Mild Cognitive Impairment. *Journal of the American Geriatrics Society*, 53, 695–699

National Institute for Health and Care Excellence. (2006). *Dementia: Supporting people with dementia and their carers in health and social care*, CG42. London: National Institute for Health and Care Excellence

Nelson, H. E. (1982). *National Adult Reading Test (NART): Test Manual*. Windsor: NFER-Nelson

Nucci, M., Mapelli, D., & Mondini, S. (2011). The Cognitive Reserve questionnaire (CRIq): a new instrument for measuring the cognitive reserve. *Aging Clinical and Experimental Research*, 24 (3), 218-26

O'Carroll, R.E., Mofoot, A., Ebmeier, K.P., & Goodwin, G.M. (1992). Estimating pre-morbid intellectual ability in the Alcoholic Korsakoff syndrome. *Psychological Medicine*, 22 (4), 903-909

O'Carroll, R.E., Prentice, N., Murray, C., van Beck, M., Ebmeier, K.P., & Goodwin, G.M. (1995). Further evidence that reading ability is not preserved in Alzheimer's disease. *British Journal of Psychiatry*, 167 (5), 659-62

Orsini, A., & Laicardi, C. (1997). *Wechsler Adult Intelligence Scale-Revised-WAIS-R, Contributo alla taratura italiana*. Firenze: Organizzazioni Speciali, Giunti

Pachana, N.A., Byrne, J., Siddle, H., Koloski, N., Harley, E., & Arnold, E. (2007). Development and validation of the Geriatric Anxiety Inventory. *International Psychogeriatrics*, 19, 103-114

Parikh, M., Grosch, M.C., Graham, LL., Hynan, L.S., Weiner, M., Shore, J.H & Cullum, C.M. (2013). Consumer Acceptability of Brief Videoconference-based Neuropsychological Assessment in Older Individuals with and without Cognitive Impairment. *The Clinical Neuropsychologist*, 27, 5, DOI: 10.1080/13854046.2013.791723

Reynolds, C.R. (1997). Postscripts on Premorbid Ability Estimation: Conceptual Addenda and a Few Words on Alternative and Conditional Approaches. *Archives of Clinical Neuropsychology*, 12 (8), 769-778

Rolstad, S., Nordlund, A., Gustavsson, M.H., Eckerström, M.H., Klang, O., Hansen, S. & Wallin, A. (2008). The Swedish National Adult Reading Test (NART-SWE): a test of premorbid IQ. *Scandinavian Journal of Psychology*, 49, 6, 577-582

Schretlen, D.J., Buffington, A.L.H., Meyer, S.M., & Pearlson, G.D. (2005). The use of word-reading to estimate premorbid ability in cognitive domains other than intelligence. *Journal of the International Neuropsychological Society*, 11, 784-78

Sharpe, K. & O'Carroll, R. (1991). Estimating premorbid intellectual level in dementia using the National Adult Reading Test: a Canadian study. *British Journal of Clinical Psychology*, 30 (4), 381- 384

Sheikh, J.I., & Yesavage, J.A. (1986). Geriatric Depression Scale (GDS): recent evidence and development of a shorter version. *Clinical Gerontologist*. 5(1/2), 165-173

Starr, J.M. & Lonie, J. (2007). Relationship between behavioural and psychological symptoms of dementia and cognition in Alzheimer's disease. *Dementia and geriatric cognitive disorders*, 24, 5, 343 - 347

Stern, Y. (2009). Cognitive Reserve. *Neuropsychologica*, 47, 2015-2028

Taylor, R. (1999). National Adult Reading Test performance in established dementia. *Archives of Gerontology and Geriatrics*, 29, 291-296

Wancata, J., Alexandrowicz, R., Marquart, B., Weiss, M., & Friedrich, F. (2006). The criterion validity of the Geriatric Depression Scale: a systematic review. *Acta Psychiatrica Scandinavica*, 114, 398–410

Wechsler, D. (2001). *Wechsler Test of Adult Reading (WTAR)*. San Antonio, TX: The Psychological Corporation

Wechsler, D. (1981). *Wechsler Adult Intelligence Scale—Revised (WAIS—R)*. San Antonio, TX: The Psychological Corporation

Wechsler, D. (2008). *Wechsler Adult Intelligence Scale—Fourth Edition (WAIS—IV)*. San Antonio, TX: The Psychological Corporation

Williams, J.M. (1992). *The Memory Assessment Scales*. Lutz, Florida: Psychological Assessment Resources.

Yuspeh, R.L., & Vandenploeg, R.D. (2000). Spot-the-Word: A Measure for Estimating Premorbid Intellectual Functioning. *Archives of Clinical Neuropsychology*, 15, (4), 319–326

6. REFERENCES FOR WHOLE THESIS

Aguirre, E., Woods, R.T., Spector, A., & Orrell, M. (2013). Cognitive stimulation for dementia: A systematic review of the evidence of effectiveness from randomised controlled trials. *Ageing Research Reviews*, 12, 253– 262

Alzheimer's Scotland. (2008) *What is Dementia?* Edinburgh: Alzheimer's Scotland

American Psychiatric Association. (1995). *Diagnostic and Statistical Manual of Mental Disorders*. IV ed. Washington, DC: American Psychiatric Association

Anderson, J., Arens, K., Johnson, R., & Coppens, P. (2001). Spaced Retrieval Vs Memory Tape Therapy in Memory Rehabilitation for Dementia of the Alzheimer's Type. *Clinical Gerontologist*, 24, 1-2, 123-139

Baddeley, A. & Wilson, B.A. (1994). When implicit learning fails: Amnesia and the problem of error elimination. *Neuropsychologia*, 32, 53-68

Baddeley, A., Emslie, H. & Nimmo-Smith, I. (1993). The Spot-the-Word Test: A robust estimate of verbal intelligence based on lexical decision. *British Journal of Clinical Psychology*, 32, 55- 65

Bae, J.N., and Cho ,M.J. (2004). Development of the Korean version of the Geriatric Depression Scale and its short form among elderly psychiatric patients. *Journal of Psychosomatic Research*; 57, 297-305

Bahar-Fuchs, A., Clare, L., & Woods, B. (2013). Cognitive training and cognitive rehabilitation for mild to moderate Alzheimer’s disease and vascular dementia. *Cochrane Database of Systematic Reviews* 2013, Issue 6. Art. No: CD003260, DOI: 10.1002/14651858.CD003260.pub2

Barona, A., Reynolds, C. R., & Chastain, R. (1984). A demographically based index of premorbid intelligence for the WAIS-R. *Journal of Consulting and Clinical Psychology*, 52, 885–887

Baxendale, S. (2011). IQ and Ability Across the Adult Life Span. *Applied Neuropsychology: Adult*, 18 (3), 164-167

Beardsall, L. (1998). Development of the Cambridge Contextual Reading Test for improving the estimation of premorbid verbal intelligence in older persons with dementia. *British Journal of Clinical Psychology*, 37 (2), 229–240

Beaunieux, H., Eustache, F., Busson, P., de la Sayette, V., Viader, F., & Desgranges, B. (2012). Cognitive procedural learning in early Alzheimer's disease: impaired processes and

compensatory mechanisms. *Journal of Neuropsychology*, 6 (1), 31-42, doi: 10.1111/j.1748-6653.2011.02002.x

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *The Beck Depression Inventory Second Edition Manual*. San Antonio: Psychological Corporation

Beck, C., Heacock, P., Mercer, S., Thatcher, R., & Sparkman, C. (1998). The impact of cognitive skills remediation training on persons with Alzheimer's disease or mixed dementia. *Journal of Geriatric Psychiatry*, 21, 73–88

Bocker, M., Eberle, N., & Gauggel, S. (2007). *Aachen Functioning Item Bank*. Germany: University Hospital of RWTH Aachen, Institute for Medical Psychology and Medical Sociology

Bortnik, K.E., Horner, M.D., & Bachman, D.L. (2013). Performance on Standard Indexes of Effort Among Patients With Dementia. *Applied Neuropsychology. Adult*, 20, 4, 233-242

Bottino, C.M.C., Carvalho, I.A.M., Alvarez, A.M., Avila, R., Zukauskas, P.R., Bustamante, S.E.Z., et al. (2005). Cognitive rehabilitation combined with drug treatment in Alzheimer's disease patients: a pilot study. *Clinical Rehabilitation*, 19, 861– 869

Bright, P., Jaldow, E., & Kopelman, M.D. (2002). The National Adult Reading Test as a measure of premorbid intelligence: A comparison with estimates derived from demographic variables. *Journal of the International Neuropsychological Society*, 8, 847-854

Cahill, J., Barkham, M., & Stiles, W.B. (2010). Systematic review of practice-based research on psychological therapies in routine clinic settings. *British Journal of Clinical Psychology*, 49, 421–453

Cahn-Weiner, D.A., Malloy, P.F., Rebok, G.W., & Ott, B.R. (2003). Results of a placebo-controlled study of memory training for mildly-impaired Alzheimer's Disease patients. *Applied Neuropsychology*, 10, 215–223

Clare, L., & Woods, B. (2008). Cognitive rehabilitation and cognitive training for early-stage Alzheimer's disease and vascular dementia. *Cochrane Database of Systematic Reviews*, Issue 4. Art. No: CD003260. DOI:0.1002/14651858.CD003260

Clare, L., Linden, D.E.J., Woods, R.T., Whitaker, R., Evans, S.J., Parkinson, C.H., van Paasschen, J., Nelis, S.M., Hoare, Z., Yuen, K.L., & Rugg, M.D. (2010). Goal-Oriented Cognitive Rehabilitation for People With Early-Stage Alzheimer Disease: A Single-Blind Randomized Controlled Trial of Clinical Efficacy. *The American Journal of Geriatric Psychiatry*, 18, 10, 928-939

Clare, L., Wilson, B.A., Carter, G., Roth, I., & Hodges, J.R. (2002). Relearning Face–Name Associations in Early Alzheimer's Disease. *Neuropsychology*, 16, (4), 538–547

Clare, L., Woods, R.T., Moniz Cook, E.D., Orrell, M., & Spector, A. (2003). Cognitive rehabilitation and cognitive training for early stage Alzheimer's disease and vascular

dementia. *Cochrane Database of Systematic Reviews*, 4, 385–401. Art. No:CD003260.. [DOI: 10.1002/14651858.CD003260]

Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112, 155-159

Colombo, L., Sartori, G., & Brivio, C. (2002). Stima del quoziente intellettivo tramite l'applicazione del TIB (test breve di Intelligenza). *Giornale Italiano di Psicologia*, 3, 613–637

Crawford, J. R., & Allan, K. M. (1997). Estimating premorbid WAIS-R IQ with demographic variables: regression equation derived from a UK sample. *The Clinical Neuropsychologist*, 11, 192–197

Crawford, J.R., Cochrane, R.H.B., Besson, J.A.O., Parker, D.M., & Stewart, L.E. (1990). Premorbid IQ estimates obtained by combining the NART and demographic variables: construct validity Person. *Individual Differences*, 11 (2), 209-210

Crawford, J.R., Stewart, L.E, Parker, D.M, et al. (1989). Estimation of premorbid intelligence: combining psychometrics and demographic approaches improves predictive accuracy. *Personality and individual differences*, 10, 793-796

Cummings, J.L. (1997). The Neuropsychiatric Inventory: assessing psychopathology in dementia patients. *Neurology*, 48, 10S–16S

Davis, R.N., Massman, P.J., & Doody, R.S. (2001). Cognitive intervention in Alzheimer disease: a randomized placebo-controlled study. *Alzheimer Disease and Associated Disorders*, 15(1), 1-9

Deeks, J.J., Dinnes, J., D'Amico, R., Sowden, A.J., Sakarovich, C., Song, F., et al. (2003) Evaluating non-randomised intervention studies. *Health Technology Assessment*, 7, 27

Downs, S. H., & Black, N. (1998). The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *Journal of Epidemiological Community Health*, 52, 377–384

Duff, K., Chelune, G.J., & Dennett, K. (2011). Predicting Estimates of Premorbid Memory Functioning: Validation in a Dementia Sample. *Archives of Clinical Neuropsychology*, 26, 701-705

Dureman, I., & Salde, H. (1959). *Psychometric and Experimental-Psychological Methods for Clinical Application* (in Swedish). Uppsala, Sweden: Almqvist and Wiksell

Dykiert, D., & Deary, I.J. (In Press). Retrospective Validation of WTAR and NART Scores as Estimators of Prior Cognitive Ability Using the Lothian Birth Cohort 1936. *Psychological Assessment*, doi/10.1037/a0033623

Field, A. (2005). *Discovering Statistics Using SPSS (2nd ed)*. London: Sage

Folstein, M. F., Folstein, S. E. & McHugh, P. R. (1975). Mini-mental state: A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*, 12 (3), 189–98

Folstein, M.F., Folstein, S.E., & McHugh, P.R. (1975). Mini-Mental State. A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*, 12(3), 189-98

Freitas, S., Simoes, M.R., Alves, L., Vicente, M., & Santana, I. (2012). Montreal Cognitive Assessment (MoCA): Validation Study for Vascular Dementia. *Journal of the International Neuropsychological Society*, 18 (6), 1031-1040

Freitas, S., Simoes, M.R., Maroco, J., Alves, L., & Santana, I. (2012). Construct Validity of the Montreal Cognitive Assessment (MoCA). *Journal of the Interventional Neuropsychological Society*, 18 (2), 242-250

Gallagher-Thompson, D., & Coon, D. (2007) Evidence-based psychological treatments for distress in family caregivers of older adults. *Psychology and Aging*, 22, 37-51

Gorno-Tempini, M.L, Brambati, S.M., Ginex, V., Ogar, J., Dronkers, N.F., Marcone, A., Perani, D., ... Miller, B.L. (2008). The logopenic/phonological variant of primary progressive aphasia. *Neurology*, 71, 1227–1234

Griffin, S.L., Mindt, M.R., Rankin, E.J., Ritchie, A.J., & Scott, J.G. (2002). Estimating premorbid intelligence and contemporary methods across the continuum. *Archives of Clinical Neuropsychology*, 17, 497-507

Heiss, W-D., Kessler, J., Mielke, R., Szekely, B., & Herholz, K. (1994). Long-term effects of phosphatidylserine, pyritinol and cognitive training in Alzheimer's disease. Aneuropsychological, EEG, and PET investigation. *Dementia*, 5(2), 88–98

Hilsabeck, R.C., & Sutker, P.B. (2009). Using an Implicit Memory Task to Estimate Premorbid Memory. *Archives of Clinical Neuropsychology*, 24, 179 - 191

Hindmarch, I., Lehfeld, H., de Jongh, P., et al. (1998). The Bayer Activities of Daily Living Scale (B-ADL). *Dementia and Geriatric Cognitive Disorders*, 9 (2), 20–26

Hodges, J. R. (2000). Memory in the dementias. In E. Tulving & F. I. M. Craik (Eds), *Oxford Handbook of Memory* (pp. 441–465). Oxford, England: Oxford University Press

Hughes, C., Berg, L., Danziger, W., Coben, L., & Martin, R. (1982). A new clinical scale for the staging of dementia. *British Journal of Psychiatry*, 140, 566–572

Hwang, H.R., Choi, S.H., Yoon, D.H., Yoon, B., Ju Suh, Y., Lee, D., Han, I., & Hong, C. (2012). The Effect of Cognitive Training in Patients with Mild Cognitive Impairment and Early Alzheimer's Disease: A Preliminary Study. *Journal of Clinical Neurology*, 8, 190-197

Kang, Y.W. (2006). A normative study of the Korean-Mini Mental State Examination (K-MMSE) in the elderly. *Korean Journal of Psychology: General*, 25, 1-12

Kato, S., Shimogaki, H., Onodera, A., et al. (1991). Development of the revised version of Hasegawa's Dementia Scale (HDS-R). *Japanese Journal of Geriatric Psychiatry*, 2, 1339–1347
(in Japanese)

Katzman, R., Terry, R., Deteresa, R et al. (1998). Clinical, pathological, and neurochemical changes in dementia: A subgroup with preserved mental status and numerous neocortical plaques. *Annals of Neurology*, 23, 138–144

Kessels, R.P.C., & Olde Henskena, L.M.G. (2009). Effects of errorless skill learning in people with mild-to-moderate or severe dementia: A randomized controlled pilot study. *NeuroRehabilitation*, 25, 307–312

Kessler, J., Markowitsch, H.J., & Denzler, P.E. (1990). *Mini-Mental-Status-Test Deutsche Fassung*. Weinheim: Beltz

Kim, H.H., and Na, D.Y. (1997). *The Korean version Boston Naming Test*. Seoul: Hakjisa

Kixmiller, J.S. (2002). Evaluation of Prospective Memory Training for Individuals with Mild Alzheimer's Disease. *Brain and Cognition* 49, 194–255

Kopelman, M.D. (1991). Frontal dysfunction and memory deficits in the alcoholic Korsakoff syndrome and Alzheimer-type dementia. *Brain*, 114 (1A), 117-137

Knechel, N.A. (2013). The Challenges of Enrolling Older Adults into Intervention Studies. *Yale Journal of Biology and Medicine*, 86, 41 - 47

Krull, K.R., Scott, J.G., & Sherer, M. (1995). Estimation of premorbid intelligence from combined performance and demographic variables. *The Clinical Neuropsychologist*, 9, 83-88

Kurz, A., Tho, A., Cramer, B., Egbert, S., Frolich, L., Gertz, H., Kehl, V., Wagenpfeil, S., & Werhaeid, K. (2012). CORDIAL: Cognitive Rehabilitation and Cognitive-behavioral Treatment for Early Dementia in Alzheimer Disease: A Multicenter, Randomized, Controlled Trial. *Alzheimer Disease and Associated Disorders*, 26, 3, 246-253

Law, M., Baptiste, S., Carswell, A., et al. (2005). *Canadian Occupational Performance Measure*. 4th ed. Ottawa, ON: CAOT Publications ACE

Law, R., & O'Carroll. (1998). A Comparison of Three Measures of Estimating Premorbid Intellectual Level in Dementia of the Alzheimer Type. *The international Journal of Geriatric Psychiatry*, 13, 727 – 720

Lezak, M.D., Howieson, D.B., Bigler, E.D., & Tranel, D. (2012). *Neuropsychological Assessment* (5th ed). New York NY: Oxford University Press

Loeb, P.A. (1996). *Independent Living Scales Manual*. San Antonio: The Psychological Corporation

Logsdon, R.G., Gibbons, L.E., McCurry, S.M., et al. (1999). Quality of life in Alzheimer's disease: patient and caregiver reports. *Journal of Mental Health and Aging*, 5, 21–32

Loring, D. W., Lee, G. P., & Meador, K. J. (1988). Revising the Rey–Osterrieth: Rating right hemisphere recall. *Archives of Clinical Neuropsychology*, 3, 239–247

Lough, S., Kipps, C.M., Treise, C., Watson, P., Blair, J.R., & Hodges, J.R. (2006). Social reasoning, emotion and empathy in frontotemporal dementia. *Neuropsychologia*, 44, 950 – 958

Lowe, D.A., & Rogers, S.A. (2011). Estimating Premorbid Intelligence among Older Adults: The Utility of the AMNART. *Journal of Aging Research*, doi:10.4061/2011/428132

MacFarlane, J., Welch, J., & Rodgers, J. (2006). Severity of Alzheimer's disease and effect on premorbid measures of intelligence. *British Journal of Clinical Psychology*, 45, 453-63

Mackinnon, A., & Mulligan, R. (2005). The estimation of premorbid intelligence levels in French speakers. *L'Encephale*, 31, 1, 1, 31 – 43 [Article in French]

Matsuda, O., Shido, E., Hashikal, A., Shibuya, H., Kouno, M, Hara, C., & Saito, M. (2010). Short-term effect of combined drug therapy and cognitive stimulation therapy on the cognitive function of Alzheimer's disease. *Psychogeriatrics*, 10, 167–172

Matthews, F.E., Arthur, A., Barnes, L.E., Bond, J., Jagger, C., Robinson, L., & Brayne, C. (2013). A two-decade comparison of prevalence of dementia in individuals aged 65 years and older from three geographical areas of England: results of the Cognitive Function and Ageing Study I and II. *The Lancet*, Early Online Publication, doi:10.1016/S0140-6736(13)61570-6

McGurn, B., Starr, J.M., Topfer, J.A., Pattie, A., Whiteman, M.C., Lemmon, H.A., Whalley, L.J., & Deary, I.J. (2004). Pronunciation of irregular words is preserved in dementia, validating premorbid IQ estimation. *Neurology*, 62 (7), 1184-1186

McKhann, G., Drachman, D., Folstein, M., Katzman, R., Price, D., & Stadlan, E.M. (1984). Clinical diagnosis of Alzheimer's disease: report of the NINCDS-ADRDA Work Group under the auspices of Department of Health and Human Services task force on Alzheimer's disease. *Neurology*, 34, 939–944

Mesulam, M.M. (2003). Primary progressive aphasia—a language-based dementia. *The New England Journal of Medicine*, 349, 1535 - 1542

Mioshi, E., Dawson, K., Mitchell, J., Arnold, R., & Hodges JR. (2006). The Addenbrooke's Cognitive Examination Revised: a brief cognitive test battery for dementia screening. *International Journal of Geriatric Psychiatry*, 21, 1078–1085

Nasreddine, Z.S., Phillips, N.A., Bedirian, V., Charbonneau, S., Whitehead, V., Collin, I., Cummings, J.L., & Chertkow, H. (2005). Montreal Cognitive Assessment, MoCA: A Brief Screening Tool For Mild Cognitive Impairment. *Journal of the American Geriatrics Society*, 53, 695–699

National Institute for Health and Care Excellence. (2006). *Dementia: Supporting people with dementia and their carers in health and social care*, CG42. London: National Institute for Health and Care Excellence

National Institute for Health and Care Excellence. (2011). *Donepezil, galantamine, rivastigmine and memantine for the treatment of Alzheimer's disease*, TA217. London: National Institute for Health and Care Excellence

Neely, A.S., Vikstrom, S., & Josephsson, S. (2009). Collaborative memory intervention in dementia: Caregiver participation matters. *Neuropsychological Rehabilitation: An international Journal*, 19, 5, 696-715

Nelson, H. E. (1982). *National Adult Reading Test (NART): Test Manual*. Windsor: NFER-Nelson

NHS Scotland. (2006). *Delivering for Mental Health*. Edinburgh: The Scottish Government

Niu, Y., Tan, J., Guan, J., Zhang, Z., & Wang, L. (2010). Cognitive stimulation therapy in the treatment of neuropsychiatric symptoms in Alzheimer disease: a randomised controlled trial. *Clinical Rehabilitation*, 24, 1102-1111

Nucci, M., Mapelli, D., & Mondini, S. (2011). The Cognitive Reserve questionnaire (CRIq): a new instrument for measuring the cognitive reserve. *Aging Clinical and Experimental Research*, 24 (3), 218-26

O'Carroll, R.E., Mofoot, A., Ebmeier, K.P., & Goodwin, G.M. (1992). Estimating pre-morbid intellectual ability in the Alcoholic Korsakoff syndrome. *Psychological Medicine*, 22 (4), 903-909

O'Carroll, R.E., Prentice, N., Murray, C., van Beck, M., Ebmeier, K.P., & Goodwin, G.M. (1995). Further evidence that reading ability is not preserved in Alzheimer's disease. *British Journal of Psychiatry*, 167 (5), 659-62

Olazarán, J., Reisburg, B., Clare.L., Cruz, I., Peña-Casanova, J., del Ser, T., Woods, B., Beck, C., Auer, S., Lai, C., Spector, A., et al. (2010). Nonpharmacological Therapies in Alzheimer's Disease: A Systematic Review of Efficacy. *Dementia and Geriatric Cognitive Disorders*, 30, 161–178, DOI: 10.1159/000316119

Orsini, A., & Laicardi, C. (1997). *Wechsler Adult Intelligence Scale-Revised-WAIS-R, Contributo alla taratura italiana*. Firenze: Organizzazioni Speciali, Giunti

Pachana, N.A., Byrne, J., Siddle, H., Koloski, N., Harley, E., & Arnold, E. (2007). Development and validation of the Geriatric Anxiety Inventory. *International Psychogeriatrics*, 19, 103-114

Pattie, A. H., & Gilleard, C. J. (1979). *Clifton Assessment Procedures for the Elderly (CAPE)*. Sevenoaks, England: Hodder & Stoughton.

Parikh, M., Grosch, M.C., Graham, LL., Hynan, L.S., Weiner, M., Shore, J.H & Cullum, C.M. (2013). Consumer Acceptability of Brief Videoconference-based Neuropsychological Assessment in Older Individuals with and without Cognitive Impairment. *The Clinical Neuropsychologist*, 27, 5, DOI: 10.1080/13854046.2013.791723

Petersen, R.C., Doody, R., Kurz, A., Mohs, R.C., Morris, J.C., Rabins, P.V., et al. (2001). Current concepts in mild cognitive impairment. *Archives of Neurology*; 58, 1985-1992

Quayhagen, M.P., Quayhagen ,M., Corbeil, R.R., Hendrix, R.C., Jackson, J.E., Snyder. L., et al. (2000). Coping with dementia: evaluation of four nonpharmacologic interventions. *International Psychgeriatrics*, 12, (2), 249-65

Reitan, R.M. (1958). Validity of the Trail Making Test as an indicator of organic brain damage. *Perceptual and Motor Skills*, 8, 271–276

Requena, C., Maestu, F., Fernandez, A., & Ortiz, T. (2006) Effects of cholinergic drugs and cognitive training on dementia: 2-year follow-up. *Dementia and Geriatric Cognitive Disorders*, 22, 339–45

Reynolds, C.R. (1997). Postscripts on Premorbid Ability Estimation: Conceptual Addenda and a Few Words on Alternative and Conditional Approaches. *Archives of Clinical Neuropsychology*, 12 (8), 769-778

Robertson, I.H., Ward, T., Ridgeway, V., et al. (1994). *The Test of Everyday Attention*. Bury St Edmunds: Thames Valley Test Company

Rolstad, S., Nordlund, A., Gustavsson, M.H., Eckerström, M.H., Klang, O., Hansen, S. & Wallin, A. (2008). The Swedish National Adult Reading Test (NART-SWE): a test of premorbid IQ. *Scandinavian Journal of Psychology*, 49, 6, 577-582

Schretlen, D.J., Buffington, A.L.H., Meyer, S.M., & Pearlson, G.D. (2005). The use of word-reading to estimate premorbid ability in cognitive domains other than intelligence. *Journal of the International Neuropsychological Society*, 11, 784-78

Scottish Intercollegiate Guidelines Network. (2006). *Management of patients with dementia, SIGN 86*. Edinburgh: Scottish Intercollegiate Guidelines Network

Sharpe, K. & O'Carroll, R. (1991). Estimating premorbid intellectual level in dementia using the National Adult Reading Test: a Canadian study. *British Journal of Clinical Psychology*, 30 (4), 381- 384

Sheikh, J.I., & Yesavage, J.A. (1986). Geriatric Depression Scale (GDS): recent evidence and development of a shorter version. *Clinical Gerontologist*. 5(1/2), 165-173

Snaith, R.P., & Zigmond, A.S. (1994). *The Hospital Anxiety and Depression Scale*. Windsor: NFER-Nelson

Spector, A., Orrell, M., & Hall, L. (2012). Systematic Review of Neuropsychological Outcomes in Dementia from Cognition-Based Psychological Interventions. *Dementia and Geriatric Cognitive Disorders*, 34, 244–255

Spector, A., Thorgrimsen, L., Woods, B., Royan, L., Davies, S., Butterworth, M., et al. (2003). Efficacy of an evidence-based cognitive stimulation therapy programme for people with dementia: randomised controlled trial. *British Journal of Psychiatry*, 183, 248–54

Starr, J.M. & Lonie, J. (2007). Relationship between behavioural and psychological symptoms of dementia and cognition in Alzheimer's disease. *Dementia and geriatric cognitive disorders*, 24, 5, 343 - 347

Stern, Y. (2009). Cognitive Reserve. *Neuropsychologica*, 47, 2015-2028

Taylor, R. (1999). National Adult Reading Test performance in established dementia. *Archives of Gerontology and Geriatrics*, 29, 291-296

The Scottish Government. (2010). *Scotland's National Dementia Strategy*. Edinburgh: The Scottish Government

Vanhalle, C., Van der Linden, M., Belleville, S., & Gilbert, B. (1998). Putting names to faces: Use of spaced retrieval strategy in a patient with dementia of the Alzheimer type. *ASHA Special Interest Division 2: Neurophysiology and neurogenic speech and language disorders*, 8, 17-21

Wancata, J., Alexandrowicz, R., Marquart, B., Weiss, M., & Friedrich, F. (2006). The criterion validity of the Geriatric Depression Scale: a systematic review. *Acta Psychiatrica Scandinavica*, 114, 398–410

Wechsler, D. (1981). *Wechsler Adult Intelligence Scale—Revised (WAIS—R)*. San Antonio, TX: The Psychological Corporation

Wechsler, D. (1987). *WMS-R: Wechsler Memory Scale – Revised (Manual)*. San Antonio: The Psychological Corporation

Wechsler, D. (2001). *Wechsler Test of Adult Reading (WTAR)*. San Antonio, TX: The Psychological Corporation

Wechsler, D. (2008). *Wechsler Adult Intelligence Scale—Fourth Edition (WAIS—IV)*. San Antonio, TX: The Psychological Corporation

Williams, J. M. (1992). *The Memory Assessment Scales*. Lutz, Florida: Psychological Assessment Resources.

Wilson, B. A., Cockburn, J., & Baddeley, A. D. (1985). *The Rivermead Behavioural Memory Test (RBMT)*. Bury St Edmunds, England: Thames Valley Test Company

Woods, B., Aguirre, E., Spector, A.E., & Orrell, M. (2012). Cognitive stimulation to improve cognitive functioning in people with dementia. *Cochrane Database of Systematic Reviews*, Issue 2. Art. No: CD005562. DOI: 10.1002/14651858.CD005562.pub2.

World Health Organisation. (1992). *The ICD-10 Classification of Mental and Behavioural disorders: Clinical Descriptions and Diagnostic Guidelines*. Geneva: World Health Organisation, Division of Mental Health

Yuspeh, R.L., & Vandenploeg, R.D. (2000). Spot-the-Word: A Measure for Estimating Premorbid Intellectual Functioning. *Archives of Clinical Neuropsychology*, 15, (4), 319–326

7. APPENDICES

APPENDIX A: SYSTEMATIC REVIEW

Appendix A1: Screenshot of Scopus citations for Downs & Black, 1998 and Cahil et al., 2010.

Appendix A2: Quality assessment checklist (from Cahill et al., 2010).

Appendix A3: Final study selection and reason for exclusion from systematic review from stage 8 of main search and stage 1 from Clare & Woods, (2008) rejected studies based on being non-RCTs.

Appendix A4: Author guidelines for systematic review. Guidelines for Neuropsychological Rehabilitation – An International Journal

Appendix A1: Screenshot of Scopus citations for Downs & Black, 1998 and Cahil et al., 2010.

The screenshot shows a Firefox browser window displaying the Scopus website. The address bar shows the URL: www.scopus.com/results/citedbyresults.url?sort=plf-f&cite=2-s2.0-0031754739&src=s&imp=t&sid=1637465D3888AC3D272629F254FBD78.zQKnzAySRvJOZYcc. The page title is "Scopus - 970 documents that cite: Th...".

The main content area shows the following information:

970 Documents that cite:
 Set feed

Downs S.H., Black N.
The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions
 (1998) *Journal of Epidemiology and Community Health*, 52 (6) , pp. 377-384.

Go to results: 53 Web

The search results are displayed in a table with the following columns: Document title, Author(s), Date, Source title, and Cited by. The results are sorted by Date (Newest).

Document title	Author(s)	Date	Source title	Cited by
1 Sex differences in the kinematics and neuromuscular control of landing: Biological, environmental and sociocultural factors	Bruton, M.R., O'Dwyer, N., Adams, R.	2013	<i>Journal of Electromyography and Kinesiology</i> 23 (4) , pp. 747-758	0
2 Perceived risk and adherence to breast cancer screening guidelines among women with a familial history of breast cancer: A review of the literature	Walker, M.J., Chiarelli, A.M., Knight, J.A., Mirea, L., Glendon, G., Ritvo, P.	2013	<i>Breast</i> 22 (4) , pp. 395-404	0
3 Aprendizagem Motora e Doença de Parkinson: Revisão de Fatores Influentes no Equilíbrio e na Propriocepção [Motor learning and parkinson disease: Review of influential factors in balance and proprioception]	Lessa, H.T.	2013	<i>Revista Neurociencias</i> 21 (2) , pp. 308-312	0
4 Behavioral stuttering interventions for children and adolescents: A systematic review and meta-analysis	Nye, C., Vanryckeghem, M., Schwartz, J.B., Herder, C., Turner III, H.M., Howard, C.	2013	<i>Journal of Speech, Language, and Hearing Research</i> 56 (3) , pp. 921-932	0

The sidebar on the left contains search filters:

Search within results
 Search

Refine results
 Limit to Exclude

Year
☐ 2013 (105) >
☐ 2012 (163) >
☐ 2011 (146) >
☐ 2010 (125) >
☐ 2009 (100) >
[View more](#)

Author Name
☐ Koren, G. (13) >
☐ Mowatt, G. (10) >
☐ Verbeek, J.H. (9) >

Firefox | Scopus - 11 documents that cite: Syst... | How to Quickly Take a Screenshot in ... | +

www.scopus.com/results/citedbyresults.url?sort=plf-f&cite=2-s2.0-78049392551&src=s&imp=t&sid=1637465D3888AC3D272629F254FBDF78.zQKnzAySRwJOZYc

SciVerse | Hub | ScienceDirect | Scopus | Applications | Activate Personalization | Logout | Go to SciVal Suite

Search | Sources | Analytics | Alerts | My list | Settings | Live Chat | Help | Tutorials

Quick Search Search

11 Documents that cite:
Set feed

Cahill J., Barkham M., Stiles W.B.
Systematic review of practice-based research on psychological therapies in routine clinic settings
(2010) *British Journal of Clinical Psychology*, 49 (4) , pp. 421-453.

Go to results: 1 Web

11 document results | Analyze results | Show all abstracts | Sort by: Date (Newest)

Search within results Search

Refine results
Limit to Exclude

Year
☐ 2013 (6) >
☐ 2012 (4) >
☐ 2011 (1) >

Author Name
☐ Lemieux, A. (2) >
☐ Beaudoin, I. (2) >
☐ Bertrand, K. (2) >
☐ Brunelle, N. (2) >
☐ Menard, J.M. (2) >

View more

	Document title	Author(s)	Date	Source title	Cited by
1	Treatment as usual (TAU) for depression: A comparison of psychotherapy, pharmacotherapy, and combined treatment at a large academic medical center	Blais, M.A., Malone, J.C., Stein, M.B., Slavin-Mulford, J., O'Keefe, S.M., Renna, M., Sinclair, S.J.	2013	<i>Psychotherapy</i> 50 (1) , pp. 110-118	0
View at Publisher Show abstract Related documents					
2	Clinically representative research in the psychological therapies: An emerging paradigm	Cahill, J.	2013	<i>Journal of Research in Nursing</i> 18 (2) , pp. 97-111	0
View at Publisher Show abstract Related documents					
3	Do Evidence-Based Interventions Work When Tested in the "Real World?" A Systematic Review and Meta-analysis of Parent Management Training for the Treatment of Child Disruptive Behavior	Michelson, D., Davenport, C., Dretzke, J., Barlow, J., Day, C.	2013	<i>Clinical Child and Family Psychology Review</i> 16 (1) , pp. 18-34	0
View at Publisher Show abstract Related documents					
4	Assessing covariates of drug use trajectories among adolescents admitted to a drug addiction center: Mental health problems, therapeutic alliance, and treatment persistence	Bertrand, K., Brunelle, N., Richer, I., Beaudoin, I., Lemieux, A., Ménard, J.-M.	2013	<i>Substance Use and Misuse</i> 48 (1-2) , pp. 117-128	0
View at Publisher Show abstract Related documents					

Appendix A2: Quality assessment checklist (from Cahill et al., 2010).

No	Criteria	Additional Info	Rating Yes=1 No=1 Unable to determine=0
Reporting			
1	Is the hypothesis/aim/objectives of the study clearly described		
2	Are the main outcomes to be measured clearly described in the introduction or methods section	If the main outcomes are first mentioned in the results section, the question should be answered No	
3	Are the characteristics of the clients included in the study clearly described	Inclusion and/or exclusion criteria should be given. Emphasis on inclusion and exclusion criteria, other characteristics are age/gender/morbidity	
4	Are the interventions/treatments of interest clearly described?	Treatments and placebo (where relevant) that are to be compared should be clearly described	
5	Are the distributions of principal confounders in each group of clients to be compared (or within a single group) clearly described?	A list of principal confounders is provided. Morbidity, co-morbidity, age, gender, previous history. Good quality will include adjustment regression or matching	
6	Are the main findings of the study clearly described?	Simple outcome data (including denominators and numerators) should be reported for all major findings so that the reader can check the major analyses and conclusions. This question does not cover statistical tests which are considered below	
7	Does the study provide estimates of the random variability in the data for the main outcomes?	In non normally distributed data the inter-quartile range of results should be reported. In normally distributed data the standard error, standard deviation, or confidence intervals should be reported. If the distribution of the data is not described, it must be assumed that the estimates used were appropriate and the question should be answered yes	
8	Have all the important adverse events that may be a consequence of the intervention/ treatment been reported?	This should be answered yes if the study demonstrates that there was a comprehensive attempt to measure adverse events (A list of adverse events is provided). E.g. early discontinuation of therapy	
9	Have the characteristics of clients lost to follow-up been described?	This should be answered yes where there were no losses to follow-up or where losses to follow-up were so small that findings would be unaffected by their inclusion. This should be	

		answered No where a study does not report the number of patients lost to follow-up. Follow up= post -therapy, or loss from study at baseline	
10	Have actual probability values been reported (e.g. 0.035 rather than ,0.05) for the main outcomes except where the probability value is less than 0.01		
11	Have sufficient data been provided to enable calculation of outcomes such as pre–post ESs, estimates of reliable and clinically significant change	If data are provided to enable calculation of any one of these outcomes score the question yes External validity/clinical representativeness	
External validity/clinical representativeness			
12a	(a) Were the clients asked to participate in the study representative of the entire population from which they were recruited	The study must identify the source population for clients and describe how the patients were selected. Clients would be representative if they comprised the entire source population, an unselected sample of consecutive clients, or a random sample. Random sampling is only feasible where a list of all members of the relevant population exists. Where a study does not report the proportion of the source population from which the patients are derived the question should be answered as unable to determine	
12b	(b) Were clients referred through usual clinic routes		
13	Were those clients who were prepared to participate representative of the entire population from which they were recruited?	The proportion of those asked who agreed should be stated. Validation that the sample was representative would included demonstrating that the distribution of the main confounding factors was the same in the study sample and the source population	
14a	a) Were client heterogeneous in personal characteristics		
14b	(b) Were clients heterogeneous in terms of presenting problems		
15a	(a) Were the staff, places, facilities where the patients were treated representative of the treatment the majority of patients receive?	For the question to be answered yes the study should demonstrate that the intervention was representative of that in use in the source population	
15b	(b) Was the treatment conducted in a non university setting	The question should be answered no if, for example, the intervention was undertaken in a specialist centre unrepresentative of the hospitals most of the source population would attend	
15c	(c) Was implementation of treatment monitored (R)		

16	Were therapists experienced, professionals with regular caseloads		
17	Were therapists free to use a wide variety of procedures in treatment and not just limited to one treatment procedure		
18	(R)Were therapists trained immediately before the study and in the specific treatment being studied		
Internal reliability of measurement and treatment			
19	If any of the results of the study were based on 'data dredging' was this made clear	Any analysis that had not been planned at the outset of the study should be clearly indicated. If no retrospective unplanned subgroup analysis were reported, then answer yes	
20	Were the statistical tests used to assess the main outcomes appropriate	The statistical techniques used must be appropriate to the data. For example, non parametric methods should be used for small sample sizes. Where little statistical analysis has been undertaken, but where there is no evidence of bias, the question should be answered yes. If the distribution of the data (normal or not) is not described it must be assumed that the estimates used were appropriate and the question should be answered yes	
21	Was the compliance with the intervention/ s/treatments reliable?	Where there was non compliance with the allocated the question should be answered no	
22	Were the main outcome measures used accurate (valid and reliable)	For studies where the outcome measures are clearly described, the question should be answered yes. For studies which refer to other work or that demonstrates the outcome measures are accurate, the question should be answered yes	
23	Do the analyses adjust for different lengths of follow-up of patients in different treatment groups?	Where no comparison group score 0. Where lengths of follow-up the same score 1	
Internal reliability of confounding variables			
24	Were the clients in different intervention /treatment groups recruited from the same population	For example, clients for all comparison groups should be selected from the same source population. The question should be answered unable to determine where there is no information concerning the source of patients included in the study. Where no comparison group score 0	
25	Were the clients in different Intervention /treatment groups	For a study which does not specify the time period over which clients were recruited, the question should be answered unable	

	recruited over the same period of time?	to determine. Where no comparison group score 0	
26	Was there adequate adjustment for confounding in the analysis from which the main findings were drawn	This question should be answered no if the main conclusions of the study were based on analyses of treatment rather than intention to treat; the distribution of known confounders was not described; or the distribution of confounders differed between the treatment groups but was not taken into account in the analyses. If the effect of the main confounders was not investigated or confounding was demonstrated but no adjustment was made in the final analyses, the question should be answered no	
27	Were losses of clients to follow-up taken into account?	If the numbers of clients lost to follow-up are not reported, the question should be answered as unable to determine. If the proportion of lost to follow-up was too small to affect the main findings, the question should be answered yes	
28	Did the study have sufficient power to detect a clinically important effect where the probability value for a difference being due to chance is less than 5%	Sample sizes have been calculated to detect a difference of x and y%. Has power analysis been performed Size of smallest intervention group A $<N1 = 0$ B $N1-N2 = 1$ C $N3-N4 = 2$ D $N5-N6 = 3$ E $N7-N8 = 4$ F $N8 \pm 5$	

Appendix A3: Final study selection and reason for exclusion from systematic review from stage 8 of main search and stage 1 from Clare & Woods, (2008) rejected studies based on being non-RCTs.

Study Name	Reason for Exclusion
Agguire 2013	Describes cognitive stimulation
Andersen 2012	Describes cognitive stimulation
Arkin 1997	No access to paper
Bernhardt 2002	In German
Brinkman 1982	Intervention as adjunct to pharmacotherapy
Brodsky 1989	Describes cognitive training
Buettner 2011	Describes cognitive stimulation
Eckroth-Bucher 2009	Describes aspects of cognitive stimulation and cognitive training
Ermi-Fuenfsch 2002	In German
Gaitan 2013	Describes cognitive training
Galante 2007	Describes cognitive training
Graessel 2011	Describes cognitive stimulation
Kwok 2013	Participant criteria not met (participants had diagnosis of MCI not dementia)
Lam 2010	Describes functional enhancement programme, not cognitive rehabilitation
Onor 2007	Describes cognitive stimulation
Panza 1996	Describes aspects of cognitive stimulation and cognitive training
Park 2009	Describes cognitive stimulation
Schrieber 1999	Describes cognitive training
Schwenk 2010	Intervention not aimed at cognitive change
Smith 2009	Participant criteria not met (participants are healthy not dementia)
Tarraga 2006	Describes cognitive stimulation
Yanguas 2006	Limited details to determine if cognitive rehabilitation
Yesavage 1981	Describes cognitive training

Appendix A4: Author guidelines for systematic review. Guidelines for Neuropsychological Rehabilitation – An International Journal

Taken from:

<http://www.tandfonline.com/action/authorSubmission?journalCode=pnrh20&page=instructions#.Uff31G2AIfs>

Neuropsychological Rehabilitation considers all manuscripts on the strict condition that they have been submitted only to *Neuropsychological Rehabilitation*, that they have not been published already, nor are they under consideration for publication or in press elsewhere. Authors who fail to adhere to this condition will be charged with all costs which *Neuropsychological Rehabilitation* incurs and their papers will not be published.

Contributions to *Neuropsychological Rehabilitation* must report original research and will be subjected to review by referees at the discretion of the Editorial Office.

This journal is compliant with the Research Councils UK OA policy. Please see the licence options and embargo periods [here](#).

Please note that *Neuropsychological Rehabilitation* uses CrossCheck™ software to screen papers for unoriginal material. By submitting your paper to *Neuropsychological Rehabilitation* you are agreeing to any necessary originality checks your paper may have to undergo during the peer review and production processes.

Manuscript preparation

1. General guidelines

- Papers are accepted only in English. British English spelling and punctuation is preferred/Any consistent spelling style may be used. Please use double quotation marks, except where “a quotation is ‘within’ a quotation”.
- There is no word limit for manuscripts submitted to this journal. Authors should include a word count with their manuscript.
- Manuscripts should be compiled in the following order: title page; abstract; keywords; main text; acknowledgments; appendixes (as appropriate); references; table(s) with caption(s) (on individual pages); figure caption(s) (as a list).
- Abstracts of 150-200 words are required for all papers submitted. Avoid abbreviations, diagrams, and references to the text in the abstract.
- Each paper should have 5 keywords.

- Search engine optimization (SEO) is a means of making your article more visible to anyone who might be looking for it. Please consult our guidance [here](#).
- All the authors of a paper should include their full names, affiliations, postal addresses, telephone numbers and email addresses on the cover page of the manuscript. One author should be identified as the corresponding author. The affiliations of all named co-authors should be the affiliation where the research was conducted. If any of the named co-authors moves affiliation during the peer review process, the new affiliation can be given as a footnote. Please note that no changes to affiliation can be made after the article is accepted. Please note that the email address of the corresponding author will normally be displayed in the article PDF (depending on the journal style) and the online article.
- Biographical notes on contributors are not required for this journal.
- For all manuscripts non-discriminatory language is mandatory. Sexist or racist terms should not be used.
- Authors must adhere to [SI units](#). Units are not italicised.
- When using a word which is or is asserted to be a proprietary term or trade mark, authors must use the symbol ® or TM.
- Authors should supply a shortened version of the title suitable for the running head, not exceeding 50 character spaces. Section headings should be concise and should not contain numbering.
- Acknowledgements should be gathered into a brief statement at the end of the text. All sources of financial sponsorship are to be acknowledged, including the names of private and public sector sponsors. This includes government grants, corporate funding, trade associations and contracts.
- Tables should be kept to the minimum. Each table should be typed double spaced on a separate page, giving the heading, e.g., "Table 2", in Arabic numerals, followed by the legend, followed by the table. Make sure that appropriate units are given. Instructions for placing the table should be given in parentheses in the text, e.g., "(Table 2 about here)".
- Results of statistical tests should be given in the following form:

"... results showed an effect of group, $F(2, 21) = 13.74$, $MSE = 451.98$, $p < .001$, but there was no effect of repeated trials, $F(5, 105) = 1.44$, $MSE = 17.70$, and no interaction, $F(10, 105) = 1.34$, $MSE = 17.70$."

Other tests should be reported in a similar manner to the above example of an F -ratio. For a fuller explanation of statistical presentation, see the *APA Publication Manual* (6th ed.).

- Abbreviations that are specific to a particular manuscript or to a very specific area of research should be avoided, and authors will be asked to spell out in full any such abbreviations throughout the text. Standard abbreviations such as RT for reaction time, SOA for stimulus onset asynchrony or other standard abbreviations that will be readily understood by readers of the journal are acceptable. Experimental conditions should be named in full, except in tables and figures.

2. Style guidelines

- [Description of the Journal's reference style](#)
- [Guide to using mathematical symbols and equations](#)

3. Figures

- It is in the author's interest to provide the highest quality figure format possible. **Please be sure that all imported scanned material is scanned at the appropriate resolution: 1200 dpi for line art, 600 dpi for grayscale and 300 dpi for colour.**
- Figures must be saved separate to text. Please do not embed figures in the paper file.
- Files should be saved as one of the following formats: TIFF (tagged image file format), PostScript or EPS (encapsulated PostScript), and should contain all the necessary font information and the source file of the application (e.g. CorelDraw/Mac, CorelDraw/PC).
- All figures must be numbered in the order in which they appear in the paper (e.g. Figure 1, Figure 2). In multi-part figures, each part should be labelled (e.g. Figure 1(a), Figure 1(b)).
- Figure captions must be saved separately, as part of the file containing the complete text of the paper, and numbered correspondingly.
- The filename for a graphic should be descriptive of the graphic, e.g. Figure1, Figure2a.

4. Publication charges

Submission fee

There is no submission fee for *Neuropsychological Rehabilitation* .

Page charges

There are no page charges for *Neuropsychological Rehabilitation* .

Colour charges

Authors should restrict their use of colour to situations where it is necessary on scientific, and not merely cosmetic, grounds. Colour figures will be reproduced in colour in the online edition of the journal free of charge. If it is necessary for the figures to be reproduced in colour in the print version, a charge will apply. Charges for colour pages are £250 per figure (\$395 US Dollars; \$385 Australian Dollars; 315 Euros). If you wish to have more than 4 colour figures, figures 5 and above will be charged at £50 per figure (\$80 US Dollars; \$75 Australian Dollars; 63 Euros). Waivers may apply for some papers – please consult pnrh-peerreview@tandf.co.uk regarding waivers.

Depending on your location, these charges may be subject to Value Added Tax .

5. Reproduction of copyright material

As an author, you are required to secure permission to reproduce any proprietary text, illustration, table, or other material, including data, audio, video, film stills, and screenshots, and any supplemental material you propose to submit. This applies to direct reproduction as well as “derivative reproduction” (where you have created a new figure or table which derives substantially

from a copyrighted source). The reproduction of short extracts of text, excluding poetry and song lyrics, for the purposes of criticism may be possible without formal permission on the basis that the quotation is reproduced accurately and full attribution is given. For further information and FAQs, please see <http://journalauthors.tandf.co.uk/permissions/usingThirdPartyMaterial.asp>

6. Supplemental online material

Authors are welcome to submit animations, movie files, sound files or any additional information for online publication.

- [Information about supplemental online material](#)

Manuscript submission

All submissions should be made online at the *Neuropsychological Rehabilitation* [ScholarOne Manuscripts site](#) . New users should first create an account. Once logged on to the site, submissions should be made via the Author Centre. Online user guides and access to a helpdesk are available on this website.

Manuscripts may be submitted in any standard format, including Word, EndNote and PDF. These files will be automatically converted into a PDF file for the review process. LaTeX files should be converted to PDF prior to submission because ScholarOne Manuscripts is not able to convert LaTeX files into PDFs directly.

- Click here for [Information regarding anonymous peer review](#)

Copyright and authors' rights

It is a condition of publication that all contributing authors grant to Taylor & Francis the necessary rights to the copyright in all articles submitted to the Journal. Authors are required to sign an Article Publishing Agreement to facilitate this. This will ensure the widest dissemination and protection against copyright infringement of articles. The "article" is defined as comprising the final, definitive, and citable Version of Scholarly Record, and includes: (a) the accepted manuscript in its final and revised form, including the text, abstract, and all accompanying tables, illustrations, data; and (b) any supplemental material. Copyright policy is explained in detail at <http://journalauthors.tandf.co.uk/permissions/reusingOwnWork.asp> .

Free article access

As an author, you will receive free access to your article on Taylor & Francis Online. You will be given access to the *My authored works* section of Taylor & Francis Online, which shows you all your published articles. You can easily view, read, and download your published articles from there. In addition, if someone has cited your article, you will be able to see this information. We are committed to promoting and increasing the visibility of your article and have provided [guidance on how you can help](#) . Also within *My authored works* , author eprints allow you as an author to quickly and easily give anyone free access to the electronic version of your article so that your friends and contacts can read and download your published article for free. This applies to all authors (not just the corresponding author).

Reprints and journal copies

Corresponding authors can receive a complimentary copy of the issue containing their article. Article reprints can be ordered through Rightslink® when you receive your proofs. If you have any queries about reprints, please contact the Taylor & Francis Author Services team at reprints@tandf.co.uk . To order extra copies of the issue containing your article, please contact our Customer Services team at Adhoc@tandf.co.uk .

Open access

Taylor & Francis Open Select provides authors or their research sponsors and funders with the option of paying a publishing fee and thereby making an article permanently available for free online access – *open access* – immediately on publication to anyone, anywhere, at any time. This option is made available once an article has been accepted in peer review.

[Full details of our Open Access programme](#)

Updated July 2013

Appendix B: Journal article

Appendix B1: Research Ethics Committee approval letter

Appendix B2: R&D approval letter

Appendix B3: Study Protocol version 5 – used for submission to REC and R&D

Appendix B4: Participant Information Sheet – Dementia Group

Appendix B5: Participant Information Sheet – Control Group

Appendix B6: Invitation Letters – Dementia Group

Appendix B7: Invitation letters – Control Group

Appendix B8: GP Letter - Dementia Group

Appendix B9: GP Letter – Control Group

Appendix B10: Consent form – Dementia Group

Appendix B11: Consent form – Control Group

Appendix B12: Demographic questionnaire

Appendix B13: Participant advice sheets

Appendix B14: Guidelines for journal submission: Journal of Clinical and Experimental Neuropsychology

Appendix B1: Research Ethics Committee approval letter**Lothian NHS Board****South East Scotland Research
Ethics Committee 02**

Waverley Gate
2-4 Waterloo Place
Edinburgh
EH1 3EG
Telephone 0131 536 9000
Fax 0131 465 5789

www.nhslothian.scot.nhs.uk

Date 03 October 2012
Your Ref
Our Ref

Enquiries to: Joyce Clearie
Extension: 35674
Direct Line: 0131 465 5674
Email: Joyce.Clearie@nhslothian.scot.nhs.uk

03 October 2012

Miss Joanne Phillips
Trainee Clinical Psychologist
NHS Lothian/The University of Edinburgh
Clinical and Health Psychology
School of Health in Social Science, Medical School,
Teviot Place, Edinburgh
EH8 9AG

Dear Miss Phillips

Study title: Can a questionnaire measuring Cognitive Reserve
provide an alternative way of estimating premorbid
functioning in individuals with dementia? A Pilot study.
REC reference: 12/SS/0163

Thank you for your letter of 03 October 2012, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information was considered in correspondence by the chair on behalf of the REC.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Ethical review of research sites

[Omit this sub-section if no NHS sites will be taking part in the study, e.g. Phase 1 trials in healthy volunteers]

NHS sites



INVESTORS
IN PEOPLE



Healthy
Working
Lives

Headquarters
Waverley Gate, 2-4 Waterloo Place, Edinburgh EH1 3EG

Chair Dr Charles J Winstanley
Chief Executive Tim Davison

Lothian NHS Board is the common name of Lothian Health Board

Appendix B2: R&D approval letter

University Hospitals Division

Queen's Medical Research Institute
47 Little France Crescent, Edinburgh, EH16 4TJ

CPP/SS/Approval

01 November 2012

Miss Joanne Phillips
Psychology Department
St John's Hospital
Livingston
EH54 6PP



Research & Development
Room E1.12
Tel: 0131 242 3330
Fax: 0131 242 3343

Email: R&DOffice@luht.scot.nhs.uk

Director: Professor David E Newby

Dear Miss Phillips

Lothian R&D Project No: 2012/R/PSY/32

Title of Research: Can a questionnaire measuring Cognitive Reserve provide an alternative way of estimating premorbid functioning in individuals with dementia? A Pilot study

REC No: 12/SS/0163

Patient Information Sheet (Group 1, Group 2): Version 3 dated 03 October 2012

Consent Form (Group 1, Group 2): dated 03 October 2012

Protocol: Version 5 dated 27 August 2012

I am pleased to inform you that this study has been approved for NHS Lothian and you may proceed with your research, subject to the conditions below. This letter provides Site Specific approval for NHS Lothian.

Please note that the NHS Lothian R&D Office must be informed if there are any changes to the study such as amendments to the protocol, recruitment, funding, personnel or resource input required of NHS Lothian. This includes any changes made subsequent to management approval and prior to favourable opinion from the REC.

Substantial amendments to the protocol will require approval from the ethics committee which approved your study and the MIRA where applicable.

Please inform this office when recruitment has closed and when the study has been completed

I wish you every success with your study.

Yours sincerely

Dr Christine P Phillips
Deputy R&D Director

Cc Paul Deane, QA Manager



Study Protocol: Can a questionnaire measuring Cognitive Reserve provide an alternative way of estimating premorbid functioning in individuals with dementia? A Pilot study.

A crucial part of diagnosing dementia requires clinicians to estimate an individuals' level of ability before the onset of cognitive decline, or their 'premorbid ability'. Traditional measures of estimating premorbid functioning (e.g NART; National Adult Reading Test; Nelson, 1982) rely on assessing word reading ability, an ability that is said to be relatively resistant to cognitive decline. However, there are numerous clinical conditions where word reading ability is impaired (e.g semantic dementia) and so these measures may not reliably predict premorbid functioning in all cases. In addition, premorbid *verbal* ability may not be wholly reflective of *global* premorbid cognitive ability e.g it may not reflect an individuals' executive functioning or visuo-spatial functioning. This pilot study aims to assess whether a newly developed questionnaire that is said to measure Cognitive Reserve, the CRIq (Cognitive Reserve Index Questionnaire, Nucci et al, 2011) can function as a measure of premorbid non-verbal ability. As the CRIq has never been used in this way before, the study will attempt to achieve proof of concept, in order that a larger study can be completed at a later date.

In order to achieve this, several factors will be considered. Any measure of premorbid functioning should fulfil the following criteria:

- 1) High correlation with intelligence (when tested in a healthy population);
- 2) Be resistant to cognitive decline (e.g dementia);
- 3) Have high inter-rater reliability.

The CRIq will be evaluated against the first two criteria to examine how well it captures non-verbal premorbid functioning. It's resistance to decline will also be compared to traditional 'gold standard' measures of premorbid functioning such as the NART. If the CRIq is found to accurately capture premorbid functioning this may provide clinicians with a tool that:

- Does not rely on word reading ability. This may be particularly useful when language is impaired (e.g in specific forms of dementia such as Semantic Dementia or in patients with Aphasia).
- Takes into account aspects of global cognitive functioning (non-verbal premorbid ability) and the ability of the brain to withstand pathology;

- Can be completed by a caregiver or someone who knows that individual well, eliminating the need to administer a test directly with the patient;
- Can be used as a complimentary measure to NART, by capturing non-verbal premorbid ability rather than verbal premorbid ability. This may provide a more global, comprehensive assessment of premorbid functioning if used together.

Aims

This pilot study will evaluate how CRiQ functions as a measure of premorbid functioning, and how it compares to traditional measures such as NART. As the CRiQ has only been investigated with an Italian speaking population, an additional aim of this study is to utilise the CRiQ with an English speaking sample.

Research Questions

- 4) How well does CRiQ correlate with a measure of current non-verbal intelligence in a healthy population? Does it capture current ability?
- 5) Is performance on the CRiQ affected by cognitive decline (dementia)? Is there any difference in performance on the CRiQ between groups?
- 6) Is performance on CRiQ related to performance on other hold tests such as NART?

Hypothesis

The null hypothesis for this study is that the CRiQ will **not**: capture premorbid non-verbal ability, be resistant to decline, and will not compare well to other hold tests.

The alternative hypothesis is that the CRiQ **will**: capture premorbid non-verbal ability, be resistant to decline, and will compare well to other hold tests.

Method of investigation

Participants

Two groups will be recruited into the study, 1) a clinical sample of individuals that have experienced cognitive decline (dementia), and 2) a control sample of healthy older adults. There will be 26 participants recruited per group. Inclusion and exclusion criteria are outlined below:

Please note that in all correspondence Group 1 refers to the Dementia Group and Group 2 refers to the Control Group.

Inclusion criteria for dementia group (Group 1)

- Diagnosis of dementia (either AD or mixed) within last 2-5 years
- Able to provide informed consent
- Are over the age of 60;
- Do not have any problems with anxiety, low mood or have any diagnosed mental health problem, as defined by clinical cut off on screening measures;
- Are a native English speaker, and do not speak any other language fluently;
- Can read and write in English;
- Do not have any significant health problem (e.g heart disease);
- Have not had any kind of brain injury e.g stroke, brain injury, tumour;
- Can self travel to [REDACTED].

Inclusion criteria for control groups (Group 2)

- Are over the age of 60;
- Do not have any problems with anxiety, low mood or have any diagnosed mental health problem, as defined by clinical cut off on screening measures;
- Are a native English speaker, and do not speak any other language fluently;
- Can read and write in English;
- Do not have any significant health problem (e.g heart disease);
- Do not have any problem with your cognitive ability (thinking skills such as memory);
- Have not had any kind of brain injury e.g stroke, brain injury, tumour;
- Can self travel to [REDACTED].

Exclusion criteria for dementia group (Group 1)

- Aged under 60
- Unable to provide informed consent
- Pre-existing cognitive impairment e.g Learning Disability, acquired brain injury, stroke.
- Sensory impairment e.g blind or deaf
- Current or history of substance misuse, life limiting illness
- Cardiovascular illness

Exclusion criteria for control group (Group 2)

- Aged under 60
- Unable to provide informed consent
- Acquired brain injury e.g Stroke, traumatic brain injury
- Sensory impairment e.g blind or deaf
- Cognitive impairment evidenced by performance below clinical cut off for dementia on screening measures (<21 on MOCA).
- Current or history of substance misuse, life limiting illness
- Cardiovascular illness

Design

This study is a quantitative, within subjects design, with participants assigned to either the dementia group or the control group. All participants will complete the CRIq, GAI, GDS-15, NART, MOCA and demographic questionnaire. The control group will complete the Perceptual Reasoning Subtests from the WAIS-IV (Wechsler Adult Intelligence Scale- Fourth Edition).

Measures

The following measures will be used in this study:

National Adult Reading Test (Nelson, 1982)

The NART is a commonly used tool that provides an estimate of premorbid cognitive functioning based on word reading ability. Participants are required to read aloud 50 irregular words. It is quick to administer and frequently used with an older adult population (e.g Schretlen et al, 2005). NART is routinely used in clinical practice, and has been shown to have high correlation with premorbid intelligence and hold over time (Crawford et al, 2001). Similarly, NART performance has been shown to be stable over time, even in individuals who go on to develop dementia (McGurn et al, 2004).

Cognitive Reserve Index Questionnaire (CRIq, Nucci et al, 2011).

The CRIQ is a self report questionnaire that aims to quantify the amount of cognitive reserve accumulated throughout an individual's lifetime. It focuses on three areas of cognitive reserve: education, working activity and leisure activities. It has recently been standardised in a sample of 558 individuals aged of 18-102, but has yet to be used with a clinical sample or an English speaking sample. It has recently been translated into English by the authors.

Geriatric Depression Scale- Short (GDS-15, Poon, 1987)

This questionnaire is a self-report questionnaire used to detect the presence of low mood and depression and was specifically developed for, and validated in, the older adults population (Sheikh, 1986). The GDS-15 has also been found to have good specificity and sensitivity in a meta-analysis of 42 papers (Wancata et al, 2006). This indicates that it can be reliably used as a screening measure for depression in later life.

Geriatric Anxiety Inventory (GAI: Pachana et al, 2007)

This is a 20 item self-report questionnaire used to measure anxiety in older people. It is reported to have good psychometric properties, with excellent inter-rater reliability (Pachana et al, 2007).

Montreal Cognitive Assessment (MOCA; Nasreddine et al, 2005)

The MOCA has been recently developed as a brief cognitive screening tool. It takes 10 minutes to complete, with participants achieving a score out of 30. The test includes aspects of language, attention, orientation, memory, naming and visuospatial/executive functioning.

Many studies typically use the MMSE (Folstein, 1975) or ACE-R (Mioshi et al, 2005), (which contains the MMSE embedded into it), as a cognitive screen. However with recent issues regarding copyright of the MMSE, both of these screening tools are no longer being used by NHS [REDACTED] Psychology. The MOCA is copyright free, and has recently been validated as being more sensitive than MMSE in detecting mild cognitive impairment, Alzheimer's disease and Vascular dementia in an elderly population, using a cut-off point of <21 for MCI and <17 for Alzheimer's disease (Freitas et al, 2011a), and Vascular Dementia (Freitas et al, 2011b).

Perceptual Reasoning Subtests from the WAIS-IV (Wechsler Adult Intelligence Scale- Fourth Edition, Wechsler, 2008)

Three subtests from the WAIS-IV will be used to assess non-verbal ability in the control group; the Block Design, Matrix Reasoning and Visual Puzzles, which comprise the Perceptual Reasoning Index. The WAIS-IV is a well validated measure of current ability, frequently used for this purpose in an older adult population (e.g Baxendale, 2011).

Demographic Questionnaire (devised by Chief Investigator)

This questionnaire will be used with both groups to ensure that the participant meets the inclusion criteria. This will also gather details of non-dementia participants' GP details in the event that they can be contacted if the researcher becomes aware of any previously unknown psychological or physical health problem/s.

Recruitment:

Control group

Healthy controls will be invited to participate from the [REDACTED] and from the Scottish Dementia Clinical Research Network (SDCRN) carer participant pool. Members of the [REDACTED] will be provided with the Participant Information Sheet (PIS) by the network and invited to participate. The SDCRN will identify carer participant pool members that meet the inclusion criteria, and will pass on those contact details to the Chief Investigator. They will then be posted a copy of the PIS and invited to participate. All participants will be invited to complete a tear off slip and post it to the Chief Investigator in they are interested in participating in the study. They will also be able to contact the Chief Investigator by telephone to ask questions and/or state their interest in participating in the study.

Dementia group

The dementia group will be recruited from NHS [REDACTED] Memory Clinics and from the SDCRN. Individuals with dementia that are registered with the SDCRN and who meet the inclusion/exclusion criteria will be identified by the SDCRN. Their contact details will be passed on to the Chief Investigator who will then be posted a copy of the PIS and invited to participate. All participants will be invited to complete a tear off slip and post it to the Chief

Investigator in they are interested in participating in the study. They will also be able to contact the Chief Investigator by telephone to ask questions and/or state their interest in participating in the study. Individuals recruited from NHS [REDACTED] Memory Clinics will be initially identified by clinical staff (Nursing, Psychiatry, Clinical Psychology) as meeting the inclusion criteria. Clinical staff will provide patients with the PIS to patients, complete a tear off slip and post it to the Chief Investigator in they are interested in participating in the study. They will also be able to contact the Chief Investigator by telephone to ask questions and/or state their interest in participating in the study.

Procedure

After participants have expressed an interest in participating in the study (by tear off slip or by phone), they will be contacted by phone, email or by post (whichever is preferred by the participant) to arrange an appointment. Control Group participants will be sent the self-report questionnaires to complete before the appointment. All appointments will take place within NHS [REDACTED] Premises at the [REDACTED] or [REDACTED]. Appointments will last approximately 1 hour and comprise of the following procedure (see Fig.1):

- Clarification of meeting inclusion criteria (5 minutes);
- Read and sign consent form (5 minutes);
- Complete demographic questionnaire (Dementia Group) (5 minutes);

Check completion of self-report questionnaires (Control Group) or complete during appointment (Dementia Group) (15 minutes):

- Geriatric Depression Scale- 15 (GDS-15; Poon, 1987), Geriatric Anxiety Inventory (GAI; Pachana et al, 2007) and the Cognitive Reserve Questionnaire (CRIQ; Nucci, Mapelli & Mondini, 2011);

Complete cognitive screening assessment (10 minutes):

- MOCA (Nasreddine et al, 2005) (10 mins)

Assessment of reading ability and intelligence:

- **Control group:** Administer WAIS-IV Perceptual Reasoning Subtest (Wechsler, 2008) max 30 mins)
- Administer National Adult Reading Test – Revised (NART-R; Nelson, 1982) (10 mins)
- Debrief, opportunity to ask questions (5 minutes).

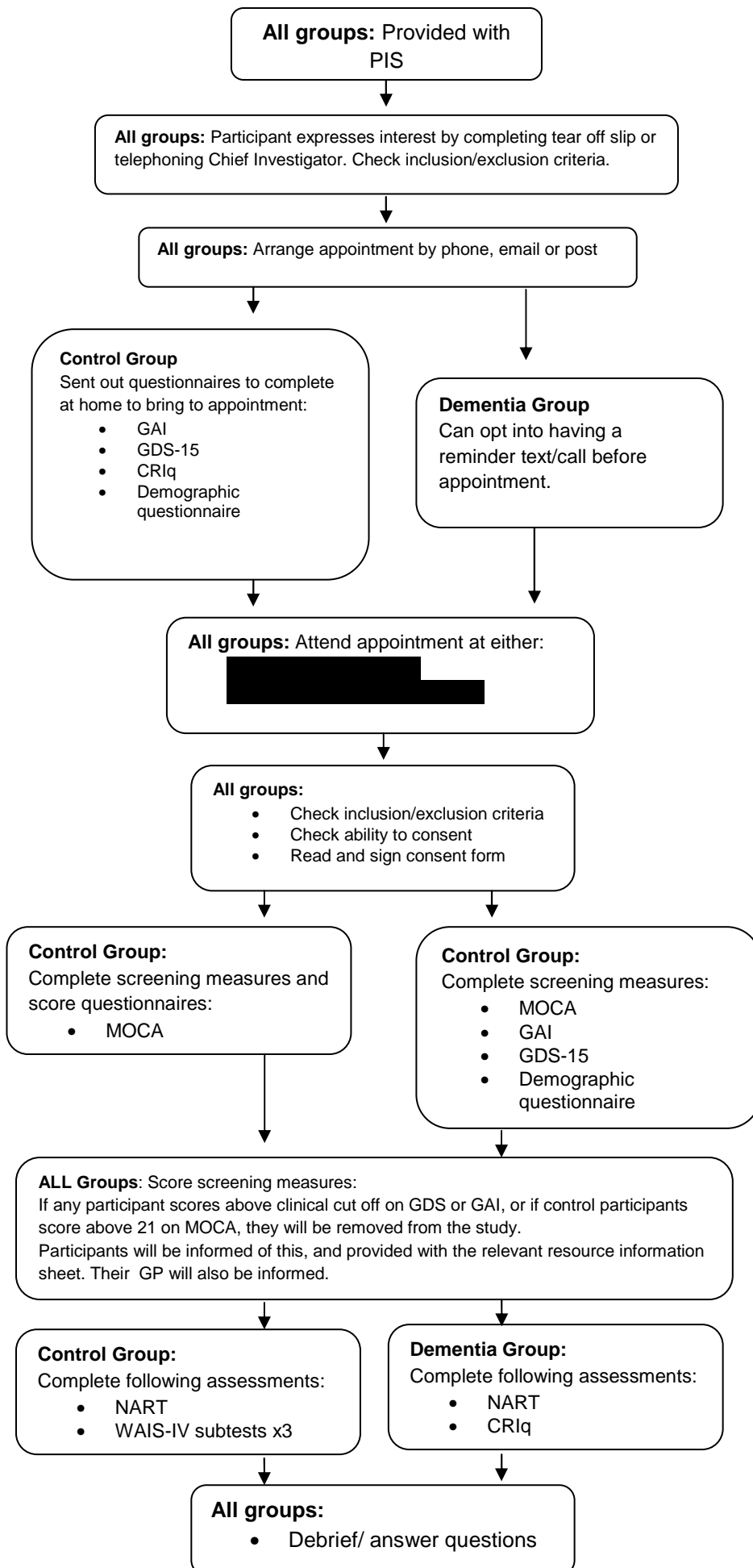


Fig 1: Summary of Procedure

All participants will be invited to take a break, reschedule the assessment or terminate participation if they become fatigued or distressed during the assessment. If participants become upset during the assessment, appropriate action will be taken. If participants are concerned about their memory after completing the assessment they will be advised to contact their GP. If participants would like to know about resources and support services for low mood, anxiety or dementia, they will be provided with an information sheet (see 'Resource Information Sheet 1' and 'Resource Information Sheet 2').

Statistical analysis

Correlational analysis will be used initially to assess the relationship between performance on all measures. Analysis of Variance (ANOVA) allows comparison between the ratio of systematic error variance to unsystematic error variance (Field, 2005) and will be used to compare any statistically significant differences in performance on all measures between the two groups. For example, a 2-way ANOVA can be used to identify any statistically significant differences in performance on CRIq and MOCA between the control group and the dementia group.

Dissemination

The findings of the study will be written up as a Doctoral Thesis in part fulfilment of the Doctorate in Clinical Psychology. A more concise write up of the project will be prepared for publication in a peer reviewed journal. A brief write up of the study will be freely available to participants, and for publication in the [REDACTED] newsletter (and any other charities/organisations that may become involved). Poster Presentations summarising the research will also be given at relevant CPD events including the annual NHS [REDACTED] Psychology conference.

Appendix B4: Participant Information Sheet – Dementia group**Understanding changes in thinking ability in later life****Participant Information Sheet****What is the study about?**

This study is examining the relationship between different questionnaires and psychological evaluations, routinely used in the assessment of memory problems.

Why have I been asked to take part?**SDCRN Members:**

This study has been approved by the Scottish Dementia Clinical Research Network (SDCRN). You have been invited to take part as you are registered with the SDCRN participant database, and have indicated that you may be interested in participating in research approved by the network. The SDCRN has identified that you may meet the criteria to be part of the study (included below) and so has passed on your name and address to the Chief Investigator. We are therefore contacting you to invite you to take part in the study. If you decide not to take part, this will not affect any future research you may be invited to participate in.

Through NHS [REDACTED] Memory Clinics:

You have been invited to take part as your clinician (e.g Doctor, Nurse, Psychologist) thinks that you may be interested in taking part in the study.

What will I be asked to do?

The study requires participants to meet with the Chief Investigator (Jo Phillips), on **one occasion** for approximately **one hour**. We will meet either at the [REDACTED], [REDACTED], or [REDACTED], whichever is more suitable for you. We will meet at a date and time convenient for you. Please note that unfortunately we are unable to reimburse your travel expenses.

At this meeting, you will have the opportunity to discuss the study and ask any questions you may have. If you still wish to participate, I will ask you to sign a consent form stating that you

agree to take part in the study. We will also inform your GP (General Practitioner) that you are taking part in the study.

We will then complete a series of tasks including:

- A word reading task;
- Questionnaires regarding your mood and your occupational and educational history.

If at any point during the assessment you no longer wish to participate, you can withdraw from the study.

Do I have to take part in the study?

No. Your participation is entirely voluntary. If you decide to take part, you will be given this information sheet to keep and will be asked to sign a consent form.

Taking part in the study will not affect the care you receive from any NHS service now or in the future.

At any point during this study, if you no longer wish to participate, you can withdraw from the study without giving a reason why.

What are the possible benefits of taking part?

There will be no immediate benefits for participants taking part in the study. The study may, however, inform how the NHS assesses memory problems in the future.

What are the possible disadvantages or risks of taking part?

You may find completing the tasks tiring, or upsetting if you find them difficult. If this is the case we may need to take a break or reschedule a later meeting to complete the assessment. If you become upset we may need to let your GP or keyworker know. We can also provide you with information about other agencies or resources to access if you are worried about your mood.

Will my taking part in the study be kept confidential?

The study is confidential. The only people allowed to see the data are myself, my supervisors, and anyone appointed by the Sponsor to check the study is being carried out correctly. The data will be anonymised so that you cannot be identified.

We will inform your General Practitioner (GP) that you are taking part in this study. We will not inform your GP of any details about your performance on the assessment, unless you report any difficulties with your mood.

If you tell me anything that makes me think that you, or others around you, are at risk of harm, I would need to inform your GP and discuss with you how to address this.

The information I gather from you will be kept for 3 years after the research has been completed, in accordance with NHS Research Ethics Guidelines.

Will I find out the results of the study?

If you wish to know the results of the study we can provide you with a written summary. The study will be completed in August 2013.

What will happen to the results of the study?

The information I collect will be written up as a Doctoral Thesis as part of my Clinical Psychology training course. I may also publish some of the data as a piece of research in a scientific journal. Any information collected will be kept anonymous and only myself and my supervisors will be able to identify the participants involved.

Who is organising the research and why?

I am conducting this study as part of my Doctorate in Clinical Psychology. It will be written up as my Doctoral Thesis.

Who has reviewed the study?

The study proposal has been reviewed by the University of Edinburgh Doctorate in Clinical Psychology course and my supervisors (Dr. Ken Laidlaw and Dr Sandy McAfee). Ethical approval has also been granted by South East Scotland Research Ethics Committee.

What to do now?

If you would like to know more about the study or are interesting in participating, please complete the tear off slip and send it to:

Jo Phillips

Trainee Clinical Psychologist



If you do not wish to participate in the study you do not have to do anything. Thank you for reading this Participant Information Sheet.

I would like to speak to an independent advisor regarding the study

If you would like to speak to someone else about the study please contact:

Dr Emily Newman
 0Health Psychology Lecturer
 School of Health in Social Science
 Old Medical School
 University of Edinburgh
 Edinburgh EH8 9AG
 0131 651 3945

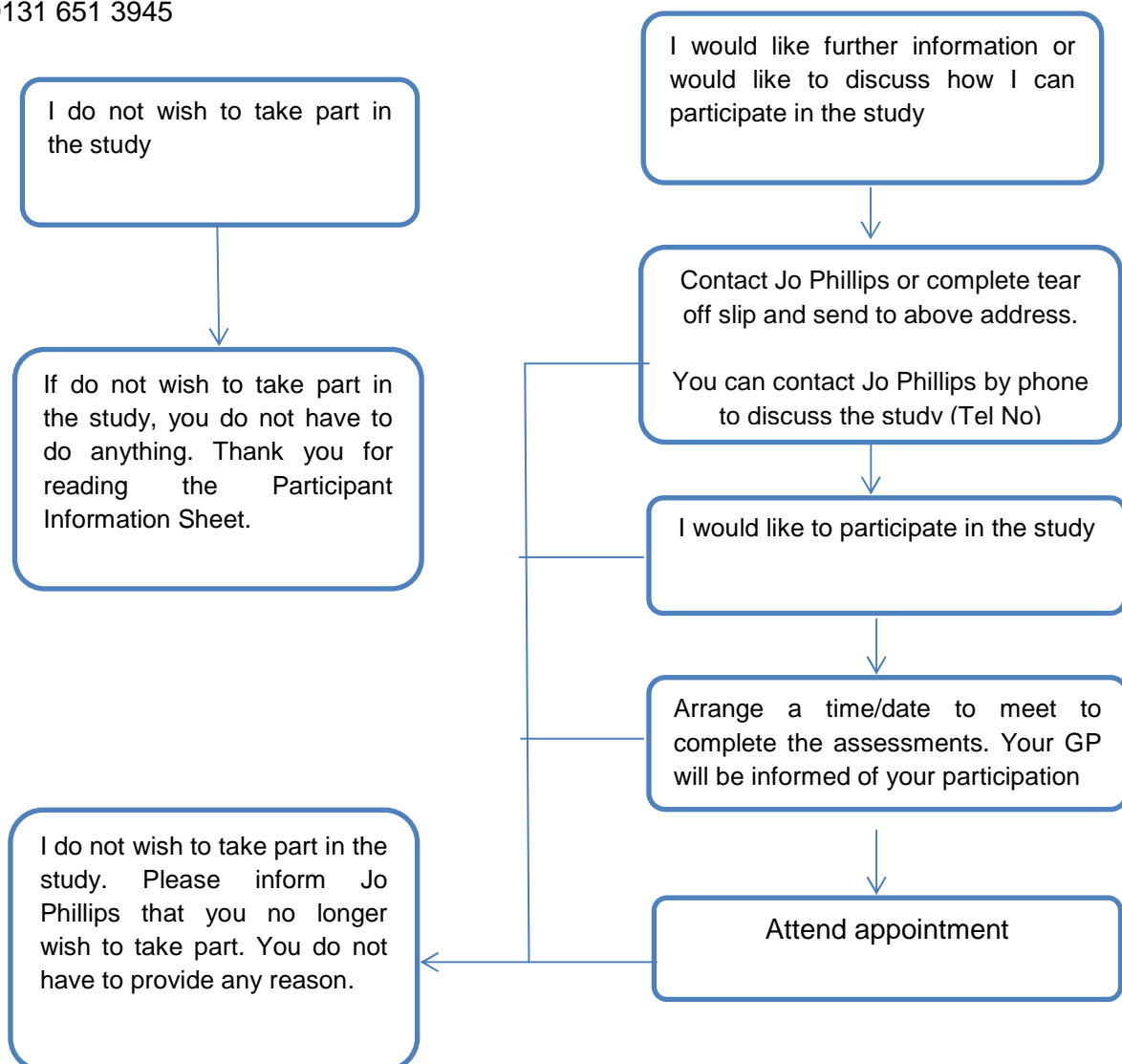


Fig 1. Flow chart explaining participation process.

Thank you for taking the time to read this information sheet

Jo Phillips, Trainee Clinical Psychologist

If you would like to participate in the study, or would like further information, please complete the tear off slip below and send it to:

Jo Phillips

Trainee Clinical Psychologist

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Group 1 opt in form

Tear off slip here

“Measuring lifelong ability and cognitive change”



I would like further information regarding the above study

☐

I would like to participate in the above study

☐

My preferred location for an appointment is:

[REDACTED]

☐

[REDACTED]

☐

Please contact me via telephone / email / post (delete as appropriate)

Name:

Address:

Email:

Contact No:

Appendix B5: Participant Information Sheet – Control Group**Measuring lifelong ability and cognitive change****Participant Information Sheet****What is the study about?**

This study is examining the relationship between different questionnaires and psychological evaluations, routinely used in the assessment of memory problems.

Why have I been invited to take part?**SDCRN Members:**

This study has been approved by the Scottish Dementia Clinical Research Network (SDCRN). You have been invited to take part as you are registered with the SDCRN Carer's database, and have indicated that you may be interested in participating in research approved by the network. The SDCRN has identified that you may meet the criteria to be part of this study (included below) and so has passed on your name and address to the Chief Investigator. We are therefore contacting you to invite you to take part in the study. If you decide not to take part, this will not affect any future research you may be invited to participate in.

██

You have been given this Participant Information Sheet as you are a member of ██████████. The ██████████ has agreed to distribute this information sheet so that members can contact the Chief Investigator if they are interested in participating in, or finding out more, about the study.

How do I know if I can take part?

You are invited to take part in the study if you:

- Are over the age of 60;
- Do not have any problems with anxiety, low mood or have any diagnosed mental health problem;
- Are a native English speaker, and do not speak any other language fluently;
- Can read and write in English;
- Do not have any significant health problem (e.g heart disease);
- Do not have any problem with your cognitive ability (thinking skills such as memory);

- Have not had any kind of brain injury e.g stroke, brain injury, tumour;
- Can self travel to [REDACTED].

What will I be asked to do?

The study requires participants to meet with the Chief Investigator (Jo Phillips), on **one occasion** for approximately **an hour and a half**. We will meet either at the [REDACTED], whichever is more suitable for you.

We will meet at a date and time convenient for you. Please note that unfortunately we are unable to reimburse your travel expenses. Before the meeting I will send you some questionnaires to complete at home before the appointment.

At this meeting, you will have the opportunity to discuss the study and ask any questions you may have. If you still wish to participate, I will ask you to sign a consent form stating that you agree to take part in the study. We will also inform your GP (General Practitioner) that you are taking part in the study.

We will then complete a series of tasks including:

- A word reading task;
- A memory task;

If at any point during the assessment you no longer wish to participate, you can withdraw from the study.

Do I have to take part in the study?

No. Your participation is entirely voluntary. If you decide to take part, you will be given this information sheet to keep and will be asked to sign a consent form.

Taking part in the study will not affect the care you receive from any NHS service now or in the future.

At any point during this study, if you no longer wish to participate, you can withdraw from the study without giving a reason why.

What are the possible benefits of taking part?

There will be no immediate benefits for participants taking part in the study. The study may, however, inform how the NHS assesses memory problems in the future.

What are the possible disadvantages or risks of taking part?

You may find completing the tasks tiring, or upsetting if you find them difficult. If this is the case we may need to take a break or reschedule a later meeting to complete the assessment. If you become upset we may need to let your GP know. We can also provide you with information about other agencies or resources to access if you are worried about your memory or mood.

Will my taking part in the study be kept confidential?

The study is confidential. The only people allowed to see the data are myself, my supervisors, and anyone appointed by the Sponsor to check the study is being carried out correctly. The data will be anonymised so that you cannot be identified.

We will inform your General Practitioner (GP) that you are taking part in this study. We will not inform your GP of any details about your performance on the assessment, unless:

- You report any difficulties with your mood;
- Your performance suggests that you may have been having significant problems with your memory.

If you tell me anything that makes me think that you, or others around you, are at risk of harm, I would need to inform your GP and discuss with you how to address this.

The information I gather from you will be kept for 3 years after the research has been completed, in accordance with NHS Research Ethics Guidelines.

Will I find out the results of the study?

If you wish to know the results of the study we can provide you with a written summary. The study will be completed in August 2013.

What will happen to the results of the study?

The information I collect will be written up as a Doctoral Thesis as part of my Clinical Psychology training course. I may also publish some of the data as a piece of research in a scientific journal. Any information collected will be kept anonymous and only myself and my supervisors will be able to identify the participants involved.

Who is organising the research and why?

I am conducting this study as part of my Doctorate in Clinical Psychology. It will be written up as my Doctoral Thesis.

Who has reviewed the study?

The study proposal has been reviewed by the University of Edinburgh Doctorate in Clinical Psychology course and my supervisors (Dr. Ken Laidlaw and Dr Sandy McAfee). Ethical approval has also been granted by South East Scotland Research Ethics Committee 2 (REC2).

What to do now?

If you would like to know more about the study or are interesting in participating, please complete the tear off slip and send it to:

Jo Phillips

[Redacted contact information]

If you do not wish to participate in the study you do not have to do anything. Thank you for reading this Participant Information Sheet.

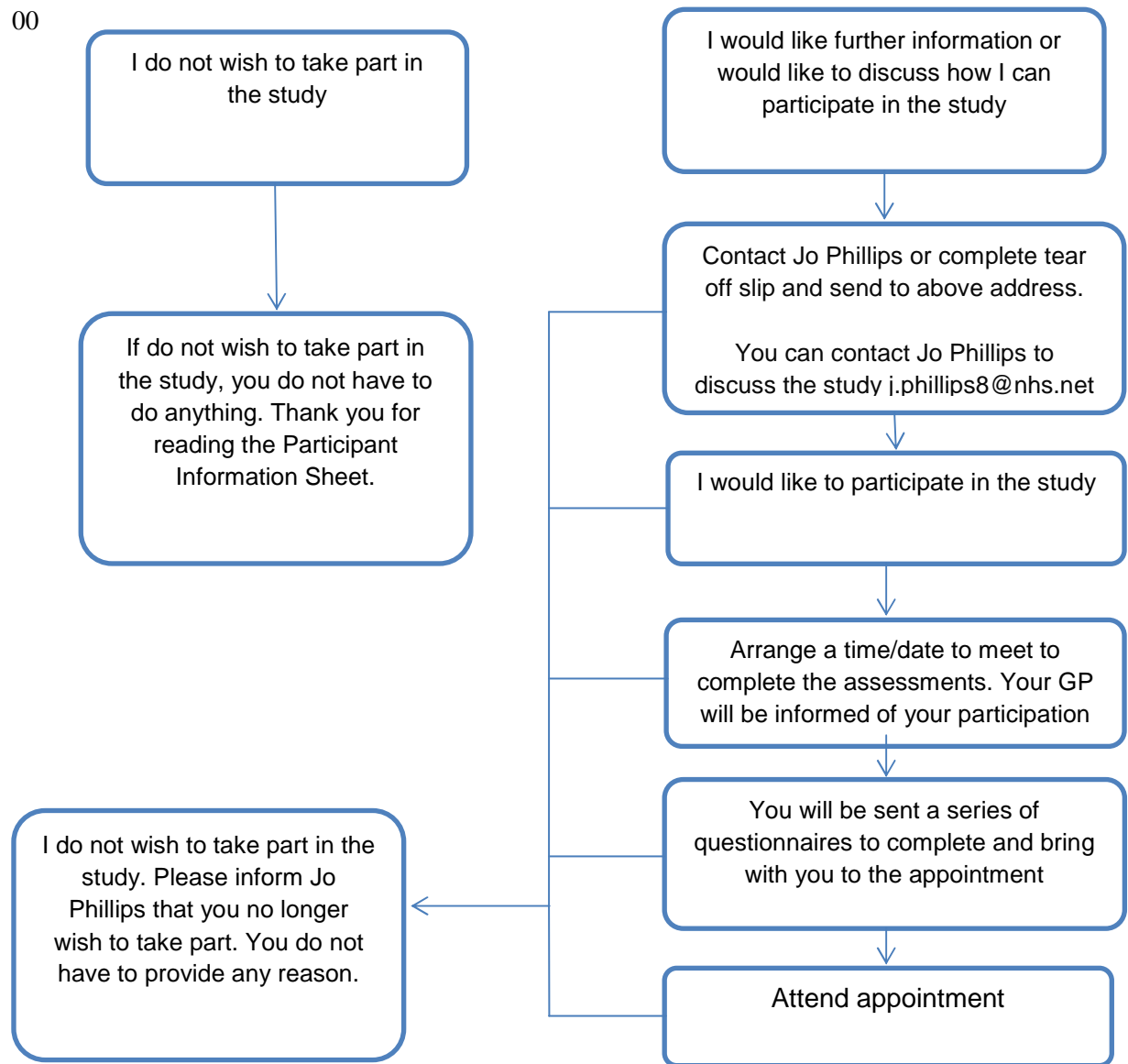


Fig 1. Flow chart explaining participation process.

I would like to speak to an independent advisor regarding the study

If you would like to speak to someone else about the study please contact:

Dr Emily Newman
Health Psychology Lecturer
School of Health in Social Science
Old Medical School
University of Edinburgh

Edinburgh EH8 9AG
0131 651 3945

Thank you for taking the time to read this information sheet

Jo Phillips, Trainee Clinical Psychologist

If you would like to participate in the study, or would like further information, please complete the tear off slip below and send it to:

Jo Phillips

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Or contact: j.phillips8@nhs.net or [REDACTED]

Tear off slip here

Group 2 opt in form

“Measuring lifelong ability and cognitive change”



I would like further information regarding the above study

☐

I would like to participate in the above study

☐

My preferred location for an appointment is:

[REDACTED]

☐

[REDACTED]

☐

Please contact me via telephone / email / post (delete as appropriate)

Name:

Address:

Email:

Contact No:

Appendix B6: Invitation Letters – Dementia Group*Group 1: Invitation letter for SDCRN members***Measuring lifelong ability and cognitive change**

Dear SDCRN member,

My name is Jo Phillips and I am training to be a Clinical Psychologist at the University of Edinburgh and work for NHS [REDACTED]. As part of my training I am carrying out a study investigating the relationship between different psychological tests.

I am writing to invite you to participate in the study. You are being provided with a Participant information Sheet as you are a member of the SDCRN (Scottish Dementia Clinical Research Network) Research Interest Register.

The following information will tell you why the study is being carried out and what would be involved if you decide to take part.

Please read the following information carefully, and feel free to show it to family and friends. It is important that you are aware that you are not obliged to participate in the study and can decide not to take part at any time.

Thank you for taking the time to read this, and please feel free to ask any questions you have about the study.

Yours sincerely,

Jo Phillips
Trainee Clinical Psychologist
The University of Edinburgh/[REDACTED]



Group 1: Invitation letter for NHS patients

Measuring lifelong ability and cognitive change

Dear Sir/ Madam,

My name is Jo Phillips and I am training to be a Clinical Psychologist at the University of Edinburgh and work for NHS [REDACTED]. As part of my training I am carrying out a study investigating the relationship between different psychological tests.

I am writing to you to invite you to participate in the study. You are being provided with a Participant information Sheet as you have indicated that you would like to hear more about the study.

The following information will tell you why the study is being carried out and what would be involved if you decide to take part.

Please read the following information carefully, and feel free to show it to family and friends. It is important that you are aware that you are not obliged to participate in the study and can decide not to take part at any time.

Thank you for taking the time to read this, and please feel free to ask any questions you have about the study.

Yours sincerely,

Jo Phillips
Trainee Clinical Psychologist
The University of Edinburgh/NHS [REDACTED]

Appendix B7: Invitation Letters - Control group*Group 2: Invitation letter for SDCRN members***Measuring lifelong ability and cognitive change**

Dear SDCRN member,

My name is Jo Phillips and I am training to be a Clinical Psychologist at the University of Edinburgh and work for NHS [REDACTED]. As part of my training I am carrying out a study investigating the relationship between different psychological tests.

I am writing to invite you to participate in the study. You are being provided with a Participant information Sheet as you are a member of the SDCRN (Scottish Dementia Clinical Research Network) Research Interest Register.

The following information will tell you why the study is being carried out and what would be involved if you decide to take part.

Please read the following information carefully, and feel free to show it to family and friends. It is important that you are aware that you are not obliged to participate in the study and can decide not to take part at any time.

Thank you for taking the time to read this, and please feel free to ask any questions you have about the study.

Yours sincerely,

Jo Phillips
Trainee Clinical Psychologist
The University of Edinburgh/NHS [REDACTED]



Group 2: Invitation letter for [REDACTED]

Measuring lifelong ability and cognitive change

Dear [REDACTED],

My name is Jo Phillips and I am training to be a Clinical Psychologist at the University of Edinburgh and work for NHS [REDACTED]. As part of my training I am carrying out a study investigating the relationship between different psychological tests.

I am writing to invite you to participate in the study. You are being provided with a Participant information Sheet as you are a member of the [REDACTED]. The [REDACTED] has kindly agreed to give out this information to its members so that interested members can participate in scientific research.

The following information will tell you why the study is being carried out and what would be involved if you decide to take part.

Please read the following information carefully, and feel free to show it to family and friends. It is important that you are aware that you are not obliged to participate in the study and can decide not to take part at any time.

Thank you for taking the time to read this, and please feel free to ask any questions you have about the study.

Yours sincerely,

Jo Phillips
Trainee Clinical Psychologist
The University of Edinburgh/NHS [REDACTED]

Appendix B8: GP Letter – Dementia group

Address

Dear Sir/Madam,

RE: Name, Address of patient, D.O.B

I am writing to inform you that has agreed to participate in my research study. The study is investigating the way in which premorbid functioning (the level of ability before the onset of illness) is estimated in patients with Dementia.

The study is being conducted in part fulfilment of the Doctorate in Clinical Psychology at the University of Edinburgh. It has been granted ethical approval by East of Scotland Research Ethics Committee (approval granted on dd/mm/yy).

..... (name of pt) has been approached as they are volunteers for the Scottish Dementia Clinical Research Network (SDCRN) or have indicated to a clinician (Psychiatrist, Nurse or Psychologist) that they would be interested in participating in the study. They will be part of a clinical group of individuals with a diagnosis of dementia given in the past 2-5 years.

The research will require participants to complete a series of mood and neuropsychological measures, and will last up to one hour. Participants will be offered breaks throughout in order to minimise fatigue.

I will not routinely inform GP's of their patients' performance in the study, unless any concerns are raised regarding;

- Low mood or anxiety
- Risk of harm to self or others.

In these instances you will be informed of any concerns that have been raised. If you would like any further information about the study, please do not hesitate to contact me.

Yours sincerely,

Jo Phillips
Trainee Clinical Psychologist

.....
.....
.....

Appendix B9: GP Letter – Control group

dd/mm/yyyy
Address

Dear Sir/Madam,

RE: Name, Address of patient, D.O.B

I am writing to inform you that has agreed to participate in my research study. The study is investigating the way in which premorbid functioning (the level of ability before the onset of illness) is estimated in patients with Dementia.

The study is being conducted in part fulfilment of the Doctorate in Clinical Psychology at the University of Edinburgh. It has been granted ethical approval by East of Scotland Research Ethics Committee (approval granted on dd/mm/yy).

..... (name of pt) has been approached as they are volunteers for the Scottish Dementia Clinical Research Network (SDCRN)/ Members of the [REDACTED] and have indicated that they would be interested in participating in the study. They will be part of a healthy control group.

The research will require participants to complete a series of mood and neuropsychological measures, and will last up to one hour. Participants will be offered breaks throughout in order to minimise fatigue.

I will not routinely inform GP's of their patients' performance in the study, unless any concerns are raised regarding;

- Low mood or anxiety
- Cognitive ability (e.g with memory)
- Risk of harm to self or others.

In these instances you will be informed of any concerns that have been raised. If you would like any further information about the study, please do not hesitate to contact me.

Yours sincerely,

Jo Phillips
Trainee Clinical Psychologist

[REDACTED]
[REDACTED]

Appendix B10: Consent form – Dementia group**Understanding changes in thinking ability in later life****Participant consent form****Please initial box**

I have read through, or someone has read to me, the Participant Information Sheet [date and version] ☐

I have had the opportunity to talk to someone about the study ☐

I am aware that my participation is voluntary and I can stop at any time, without having to give a reason why ☐

I know that my involvement with the study will not affect the care I receive from any service, now, or in the future (whether or not you decide to participate) ☐

I understand that my General Practitioner (GP) will be informed that I am taking part in the study ☐

I understand that my GP will be informed if, through my participation in the study, there are any concerns raised, regarding:

- Low mood or anxiety ☐
- My own, or someone else's safety ☐

I understand that all information given by me in this study will remain confidential ☐

I would like to receive a written summary of the key findings ☐

I understand that relevant sections of my medical notes, and data collected during the study, may be looked at by the study researchers and individuals from the Sponsor, regulatory authorities or from the NHS organisation, where it is relevant to my taking part in this research. I give permission for these individuals to have access to my records ☐

I **agree** to take part in this study

☐

Participant Name:

Signature:

Date:

Researcher Name:

Signature:

Date:

Appendix B11: Consent form – Control group**Measuring lifelong ability and cognitive change****Participant consent form****Please initial box**

I have read through, or someone has read to me, the Participant Information Sheet [date and version] ☐

I have had the opportunity to talk to someone about the study ☐

I am aware that my participation is voluntary and I can stop at any time, without having to give a reason why ☐

I know that my involvement with the study will not affect the care I receive from any service, now, or in the future (whether or not you decide to participate) ☐

I understand that my General Practitioner (GP) will be informed that I am taking part in the study ☐

I understand that my GP will be informed if, through my participation in the study, there are any concerns raised, regarding:

- Low mood or anxiety ☐
- My own, or someone else's safety ☐
- My cognitive ability (e.g memory) ☐

I understand that all information given by me in this study will remain confidential ☐

I would like to receive a written summary of the key findings ☐

I understand that relevant sections of my medical notes, and data collected during the study, may be looked at by the study researchers and individuals from the Sponsor, regulatory authorities or from the NHS organisation, where it is relevant to my taking part in this research. I give permission for these individuals to have access to my records ☐

.....

I **agree** to take part in this study

☐

Participant Name:

Signature:

Date:

Researcher Name:

Signature:

Date:

Appendix B12: Demographic questionnaire

Participant code			
Gender			
Date of Birth		Age	
Handedness		Years of education	
Wearing glasses if needed?			
Hearing difficulties?		Wearing hearing aids?	
Occupational History			
Working/retired			
Occupational history			
Age at retirement		Marital status	
Medical History			
Dementia Diagnosis type		Date of diagnosis	
Date on onset of symptoms		Diagnosed by (professional)	
Medication for dementia?			
Other physical health conditions			
Other medications			
Currently being seen by any medical professional?			
Currently receiving treatment or undergoing medical investigation?			
History of brain injury (e.g TBI, tumor, stroke, TIA)			
Smoker/ Alcohol			
Mental Health History			
Any history of mental health difficulty (diagnosis, treatment received)			
Currently experiencing mental health difficulty?			
Additional Information			

Does participant meet inclusion criteria?	Yes		No		Further review required	
---	-----	--	----	--	-------------------------	--

Appendix B13: Participant advice sheets

What to do if you are worried about your mood

If you are feeling low in mood or are experiencing anxiety, you should arrange an appointment with your GP (General Practitioner) to discuss this.

You may also find the following resources helpful:



The NHS Choices website has a selection of information sheets regarding:

Depression:

www.nhs.uk/conditions/depression

Anxiety:

www.nhs.uk/conditions/anxiety



Breathing space is a free, confidential phone and internet based service for people in Scotland experiencing low mood, depression or anxiety.



0800 83 85 87

www.breathingspacescotland.co.uk

What to do if you are worried about your memory

If you are worried about your memory, you should make an appointment with your GP (General Practitioner) to discuss this.

You may also find the following resource helpful:



The NHS Choices website has a selection of information sheets regarding:

Memory loss:

www.nhs.uk/conditions/memory-loss

Appendix B14: Journal guidelines for authors: Journal of Clinical and Experimental Neuropsychology

Taken from:

<http://www.tandfonline.com/action/authorSubmission?journalCode=ncen20&page=instructions#.UfgOIW2Alfs>

***Journal of Clinical and Experimental Neuropsychology* considers all manuscripts on the strict condition that they have been submitted only to *Journal of Clinical and Experimental Neuropsychology*, that they have not been published already, nor are they under consideration for publication or in press elsewhere. Authors who fail to adhere to this condition will be charged with all costs which *Journal of Clinical and Experimental Neuropsychology* incurs and their papers will not be published.**

Contributions to *Journal of Clinical and Experimental Neuropsychology* must report original research and will be subjected to review by referees at the discretion of the Editorial Office.

Please note that *Journal of Clinical and Experimental Neuropsychology* uses CrossCheck™ software to screen papers for unoriginal material. By submitting your paper to *Journal of Clinical and Experimental Neuropsychology* you are agreeing to any necessary originality checks your paper may have to undergo during the peer review and production processes.

This journal is compliant with the Research Councils UK OA policy. Please see the licence options and embargo periods [here](#).

Manuscript preparation

1. Journal-specific guidelines

- Papers are accepted only in English. American English spelling and punctuation is preferred. Please use double quotation marks, except where “a quotation is ‘within’ a quotation”.
- There is no word limit for manuscripts submitted to this journal. Authors should include a word count with their manuscript.
- **Abstracts** of 100 words are required for all papers submitted.
- **Abbreviations** that are specific to a particular manuscript or to a very specific area of research should be avoided, and authors will be asked to spell out in full any such abbreviations throughout the text. Standard abbreviations such as RT for reaction time, SOA for stimulus onset asynchrony or other standard abbreviations that will be readily understood by readers of the journal are acceptable. Experimental conditions should be named in full, except in tables and figures.

- **Colour charges.** Authors should restrict their use of colour to situations where it is necessary on scientific, and not merely cosmetic, grounds. Colour figures will be reproduced in colour in the online edition of the journal free of charge. If it is necessary for the figures to be reproduced in colour in the print version, a charge will apply. Charges for colour pages are £250 per figure (\$395 US Dollars; \$385 Australian Dollars; 315 Euros). If you wish to have more than 4 colour figures, figures 5 and above will be charged at £50 per figure (\$80 US Dollars; \$75 Australian Dollars; 63 Euros). Waivers may apply for some papers – please consult the Production Editor regarding waivers. Depending on your location, these charges may be subject to Value Added Tax .

2. General guidelines

- The style and format of the typescripts should conform to the specifications given in the *Publication Manual of the American Psychological Association* (6th ed.).
- All parts of the manuscript should be double-spaced, with margins of at least one inch on all sides. Number manuscript pages consecutively throughout the paper.
- Authors must adhere to SI units . Units are not italicised.
- **Section headings** should be concise and should not contain numbering.
- Authors should indicate whether their paper is a regular (original) article, a brief article, a case study or a review. Authors should include a word count with their submission.
- **Manuscripts** should be compiled in the following order: title page; abstract; keywords; main text; acknowledgments; appendices (as appropriate); references; table(s) with caption(s) (on individual pages); figure caption(s) (as a list).
- **Title page.** This should contain only:
 - (1) the title of the paper, the name(s) and address(es) of the author(s);
 - (2) a shortened version of the title suitable for the running head, not exceeding 40 character spaces;
 - (3) the name, address, email address, telephone, and fax numbers of one author to whom correspondence and proofs should be sent;

The affiliations of all named co-authors should be the affiliation where the research was conducted. If any of the named co-authors moves affiliation during the peer review process, the new affiliation can be given as a footnote. Please note that no changes to affiliation can be made after the article is accepted.
- Each paper should have up to 5 keywords . Search engine optimization (SEO) is a means of making your article more visible to anyone who might be looking for it. Please consult our guidance here .
- **Tables** should be kept to the minimum. Each table should be typed double spaced on a separate page, giving the heading, e.g., "Table 2", in Arabic numerals, followed by the legend, followed by the table. Make sure that appropriate units are given. Instructions for placing the table should be given in parentheses in the text, e.g., "(Table 2 about here)".
- **Results** of statistical tests should be given in the following form:
 "... results showed an effect of group, $F(2, 21) = 13.74$, $MSE = 451.98$, $p < .001$, but there was no effect of repeated trials, $F(5, 105) = 1.44$, $MSE = 17.70$, and no interaction, $F(10, 105) = 1.34$, $MSE = 17.70$." Other tests should be reported in a similar manner to the above example of an F -ratio. For a fuller explanation of statistical presentation, see the *APA Publication Manual* (6th ed.).
- **Abbreviations** that are specific to a particular manuscript or to a very specific area of research should be avoided, and authors will be asked to spell out in full any such

abbreviations throughout the text. Standard abbreviations such as RT for reaction time, SOA for stimulus onset asynchrony or other standard abbreviations that will be readily understood by readers of the journal are acceptable. Experimental conditions should be named in full, except in tables and figures.

- **Acknowledgements** should be gathered into a brief statement after the correspondence. All sources of financial sponsorship are to be acknowledged, including the names of private and public sector sponsors. This includes government grants, corporate funding, trade associations and contracts.
- **Footnotes** should be avoided unless absolutely necessary. Essential footnotes should be indicated by superscript figures in the text and collected on a separate page at the end of the manuscript.
- **Biographical notes** on contributors are not required for this journal.
- For all manuscripts non-discriminatory language is mandatory. Sexist or racist terms should not be used.
- When using a word which is or is asserted to be a proprietary term or trade mark, authors must use the symbol ® or TM.

3. Style guidelines

- Description of the Journal's reference style
- Guide to using mathematical symbols and equations

4. Figures

- It is in the author's interest to provide the highest quality figure format possible. Please be sure that all imported scanned material is scanned at the appropriate resolution: 1200 dpi for line art, 600 dpi for grayscale and 300 dpi for colour.
- Figures must be saved separate to text. Please do not embed figures in the paper file.
- Files should be saved as one of the following formats: TIFF (tagged image file format), PostScript or EPS (encapsulated PostScript), and should contain all the necessary font information and the source file of the application (e.g. CorelDraw/Mac, CorelDraw/PC).
- All figures must be numbered in the order in which they appear in the paper (e.g. Figure 1, Figure 2). In multi-part figures, each part should be labelled (e.g. Figure 1(a), Figure 1(b)).
- Figure captions must be saved separately, as part of the file containing the complete text of the paper, and numbered correspondingly.
- The filename for a graphic should be descriptive of the graphic, e.g. Figure1, Figure2a.

5. Publication charges

- **Submission fee.** There is no submission fee for *Journal of Clinical and Experimental Neuropsychology*.
- **Page charges.** There are no page charges for *Journal of Clinical and Experimental Neuropsychology*.

6. Reproduction of copyright material

As an author, you are required to secure permission to reproduce any proprietary text, illustration, table, or other material, including data, audio, video, film stills, and screenshots, and any

supplemental material you propose to submit. This applies to direct reproduction as well as “derivative reproduction” (where you have created a new figure or table which derives substantially from a copyrighted source). The reproduction of short extracts of text, excluding poetry and song lyrics, for the purposes of criticism may be possible without formal permission on the basis that the quotation is reproduced accurately and full attribution is given. For further information and FAQs, please see <http://journalauthors.tandf.co.uk/permissions/usingThirdPartyMaterial.asp>

Image copyright and permission

If you use an image from the Internet in your manuscript you will need to find out the status of the image and find out who owns the copyright (this may be the photographer, artist, agency, museum, or library). You will then need to request permission from the copyright holder to reproduce the image in a journal article, in all forms, in perpetuity, worldwide, on the basis that proper attribution and acknowledgment to the copyright holder will be given in the figure caption.

7. Supplemental online material

Authors are welcome to submit animations, movie files, sound files or any additional information for online publication.

- [Information about supplemental online material](#)

8. Publication ethics

- [Disclosure of Conflicts of Interest](#)
- [Ethics and Consent Standards](#)

Manuscript submission

All submissions should be made online at the *Journal of Clinical and Experimental Neuropsychology* [ScholarOne Manuscripts site](#) . New users should first create an account. Once logged on to the site, submissions should be made via the Author Centre. Online user guides and access to a helpdesk are available on this website.

Manuscripts may be submitted in any standard format, including Word, EndNote and PDF. These files will be automatically converted into a PDF file for the review process. LaTeX files should be converted to PDF prior to submission because ScholarOne Manuscripts is not able to convert LaTeX files into PDFs directly. If any assistance is needed with this, please feel free to email the Editorial Assistant at ncen-peerreview@tandf.co.uk .

Click here for [Information regarding anonymous peer review](#)

Copyright and authors' rights

It is a condition of publication that all contributing authors grant to Taylor & Francis the necessary rights to the copyright in all articles submitted to the Journal. Authors are required to sign an Article Publishing Agreement to facilitate this. This will ensure the widest dissemination and protection against copyright infringement of articles. The “article” is defined as comprising the final, definitive, and citable Version of Scholarly Record, and includes: (*a*) the accepted manuscript in its final and revised form, including the text, abstract, and all accompanying tables, illustrations, data; and (*b*) any supplemental material. Copyright policy is explained in detail at <http://journalauthors.tandf.co.uk/permissions/reusingOwnWork.asp> .

After acceptance

- [Click here for guidance on Checking Proofs](#)
- [Click here for guidance on Copy-editing](#)

Free article access

As an author, you will receive free access to your article on Taylor & Francis Online. You will be given access to the *My authored works* section of Taylor & Francis Online, which shows you all your published articles. You can easily view, read, and download your published articles from there. In addition, if someone has cited your article, you will be able to see this information. We are committed to promoting and increasing the visibility of your article and have provided [guidance on how you can help](#) . Also within *My authored works* , author eprints allow you as an author to quickly and easily give anyone free access to the electronic version of your article so that your friends and contacts can read and download your published article for free. This applies to all authors (not just the corresponding author).

Reprints and journal copies

Corresponding authors can receive a complimentary copy of the issue containing their article. Article reprints can be ordered through Rightslink® when you receive your proofs. If you have any queries about reprints, please contact the Taylor & Francis Author Services team at reprints@tandf.co.uk . To order extra copies of the issue containing your article, please contact our Customer Services team at adhoc@tandf.co.uk .

Open access

Taylor & Francis Open Select provides authors or their research sponsors and funders with the option of paying a publishing fee and thereby making an article permanently available for free online access – *open access* – immediately on publication to anyone, anywhere, at any time. This option is made available once an article has been accepted in peer review. [Full details of our Open Access programme](#)

APPENDIX C: Amended forms for journal article. Documents submitted for substantial amendment May 2013 and used thereafter with participants

Appendix C1: R&D approval for study amendment

Appendix C2: REC approval for study amendment

Appendix C3: Protocol Version 9, revised for study amendment

Appendix C4: Amended Participant Information Sheet – Dementia Group

Appendix C5: Amended Participant Information Sheet – Control Group

Appendix C1: Confirmation of approval from R&D for amendment.**University Hospitals Division**

Queen's Medical Research Institute
 47 Little France Crescent, Edinburgh, EH16 4TJ

KM/LM

14 May 2013

Miss Joanne Phillips
 Psychology Department
 St Johns Hospital
 Livingston
 EH54 6PP



RESEARCH &
 DEVELOPMENT
 Room E1.12
 Tel: 0131 242 3330
 Fax: 0131 242 3343
 Email:
 R&DOffice@luhl.scot.nhs.uk

Director:
 Professor David E Newby

Dear Miss Phillips

REC No: 12/SS/0163
R&D Project ID No: 2012/P/PSY/32
Amendment: Substantial amendment No.01 dated 5 May 2013
Title of Research Can a questionnaire measuring Cognitive Reserve provide an alternative way of estimating premorbid functioning in individuals with dementia? A Pilot study.

I am writing in reply to recent correspondence in relation to an amendment(s) to the above project and the subsequent updated documents as follows.

- o Protocol – Version 8 dated 25 April 2013
- o Participant Information Sheet (Group 1) – Version 3 dated 23 April 2013
- o Participant Information Sheet (Group 2) – Version 3 dated 23 April 2013

We have now assessed any consequential changes and can confirm that NHS Lothian management approval is extended to cover the specific changes intimated.

Following a Research Ethics Committee final favourable opinion, the Research Ethics Committee letter of favourable opinion should be sent to the R&D office. Management approval will only be valid after favourable opinion has been received.

Yours sincerely

A handwritten signature in black ink, appearing to read 'K Maitland', written over a horizontal line.

Mrs Karen Maitland
 Research Governance Manager

Appendix C2: Confirmation of Research Ethics Committee approval for amendment**Lothian NHS Board****South East Scotland Research
Ethics Committee 02**

Waverley Gate
2-4 Waterloo Place
Edinburgh
EH1 3EG
Telephone 0131 536 9000
Fax 0131 465 5789

www.nhsllothian.scot.nhs.uk

Date 15 May 2013
Your Ref
Our Ref

Enquiries to: Joyce Clearie
Extension: 35674
Direct Line: 0131 465 5674
Email: Joyce.Clearie@nhsllothian.scot.nhs.uk

15 May 2013

Miss Joanne Phillips
Trainee Clinical Psychologist
NHS Lothian/The University of Edinburgh
Clinical and Health Psychology
School of Health in Social Science, Medical School,
Teviot Place, Edinburgh
EH8 9AG

Dear Miss Phillips

Study title: Can a questionnaire measuring Cognitive Reserve provide an alternative way of estimating premorbid functioning in individuals with dementia? A Pilot study.
REC reference: 12/SS/0163
Amendment number: AMO1 SA1
Amendment date: 05 May 2013
IRAS project ID: 95060

The above amendment was reviewed by the Sub-Committee in correspondence.

Ethical opinion

The members of the Committee taking part in the review gave a favourable ethical opinion of the amendment on the basis described in the notice of amendment form and supporting documentation.

Approved documents

The documents reviewed and approved at the meeting were:

Document	Version	Date
Participant Information Sheet: PIS group 2	2	23 April 2013
Participant Information Sheet: PIS group 1	3	23 April 2013
Notice of Substantial Amendment (non-CTIMPs)		05 May 2013
Protocol	9	14 May 2013

Membership of the Committee

The members of the Committee who took part in the review are listed on the attached sheet.



Headquarters
Waverley Gate, 2-4 Waterloo Place, Edinburgh EH1 3EG

Chair Mr Brian Houston
Chief Executive Tim Davison
Lothian NHS Board is the common name of Lothian Health Board



R&D approval

All investigators and research collaborators in the NHS should notify the R&D office for the relevant NHS care organisation of this amendment and check whether it affects R&D approval of the research.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

We are pleased to welcome researchers and R & D staff at our NRES committee members' training days – see details at <http://nhs.uk/nhs.uk/rdtraining/>

12/55/0163:

Please quote this number on all correspondence

Yours sincerely

Mr Thomas Russell
Chair

Email: joyce.dearie@nhslothian.scot.nhs.uk

Enclosure:

List of names and professions of members who took part in the review

Copy to:

Karen Mulford, Research & Development Department
Marlene Linn



South East Scotland Research Ethics Committee 2
Sub-Committee of the REC meeting (2) May 2013

Name	Profession	Capacity
Mr Thomas Russell	Retired Consultant Neurosurgeon	Expert
Professor Lindsay Sawyer	University Lecturer	Lay

Also in attendance:

Name	Position /or reason for attending
Dr Alex Bailey	Scientific Officer
Ms Joyce Cleane	Coordinator

Appendix C3: Revised protocol for study amendment May 2013. Changes to original protocol are highlighted



Study Protocol: Can a questionnaire measuring Cognitive Reserve provide an alternative way of estimating premorbid functioning in individuals with dementia? A Pilot study.

A crucial part of diagnosing dementia requires clinicians to estimate an individuals' level of ability before the onset of cognitive decline, or their 'premorbid ability'. Traditional measures of estimating premorbid functioning (e.g NART; National Adult Reading Test; Nelson, 1982) rely on assessing word reading ability, an ability that is said to be relatively resistant to cognitive decline. However, there are numerous clinical conditions where word reading ability is impaired (e.g semantic dementia) and so these measures may not reliably predict premorbid functioning in all cases. In addition, premorbid *verbal* ability may not be wholly reflective of *global* premorbid cognitive ability e.g it may not reflect an individuals' executive functioning or visuo-spatial functioning. This pilot study aims to assess whether a newly developed questionnaire that is said to measure Cognitive Reserve, the CRIq (Cognitive Reserve Index Questionnaire, Nucci et al, 2011) can function as a measure of premorbid non-verbal ability. As the CRIq has never been used in this way before, the study will attempt to achieve proof of concept, in order that a larger study can be completed at a later date.

In order to achieve this, several factors will be considered. Any measure of premorbid functioning should fulfil the following criteria:

1. High correlation with intelligence (when tested in a healthy population);
2. Be resistant to cognitive decline (e.g dementia);
3. Have high inter-rater reliability.

The CRIq will be evaluated against the first two criteria to examine how well it captures non-verbal premorbid functioning. It's resistance to decline will also be compared to traditional 'gold standard' measures of premorbid functioning such as the NART. If the CRIq is found to accurately capture premorbid functioning this may provide clinicians with a tool that:

- Does not rely on word reading ability. This may be particularly useful when language is impaired (e.g in specific forms of dementia such as Semantic Dementia or in patients with Aphasia).
- Takes into account aspects of global cognitive functioning (non-verbal premorbid ability) and the ability of the brain to withstand pathology;
- Can be completed by a caregiver or someone who knows that individual well, eliminating the need to administer a test directly with the patient;
- Can be used as a complimentary measure to NART, by capturing non-verbal premorbid ability rather than verbal premorbid ability. This may provide a more global, comprehensive assessment of premorbid functioning if used together.

Aims

This pilot study will evaluate how the CRIq functions as a measure of premorbid ability, and how it compares to traditional measures such as NART. As the CRIq has only been investigated with an Italian speaking population, an additional aim of this study is to utilise the CRIq with an English speaking sample.

Research Questions

- 1) How well does CRIq correlate with a measure of current non-verbal intelligence in a healthy population? Does it capture current ability?
- 2) Is performance on the CRIq affected by cognitive decline (dementia)? Is there any difference in performance on the CRIq between groups?
- 3) Is performance on CRIq related to performance on other hold tests such as NART?

Hypothesis

The null hypothesis for this study is that the CRIq will **not**: capture premorbid non-verbal ability, be resistant to decline, and will not compare well to other hold tests.

The alternative hypothesis is that the CRIq **will**: capture premorbid non-verbal ability, be resistant to decline, and will compare well to other hold tests.

Method of investigation

Participants

Two groups will be recruited into the study, 1) a clinical sample of individuals that have experienced cognitive decline (dementia), and 2) a control sample of healthy older adults. There will be 26 participants recruited per group. Inclusion and exclusion criteria are outlined below:

Please note that in all correspondence Group 1 refers to the Dementia Group and Group 2 refers to the Control Group.

Inclusion criteria for dementia group (Group 1)

- Diagnosis of dementia (either AD or mixed) within last 2-5 years
- Able to provide informed consent
- Are over the age of 60;
- Do not have any problems with anxiety, low mood or have any diagnosed mental health problem, as defined by clinical cut off on screening measures;
- Are a native English speaker, and do not speak any other language fluently;
- Can read and write in English;
- Do not have any significant health

Inclusion criteria for control groups (Group 2)

- Are over the age of 60;
- Do not have any problems with anxiety, low mood or have any diagnosed mental health problem, as defined by clinical cut off on screening measures;
- Are a native English speaker, and do not speak any other language fluently;
- Can read and write in English;
- Do not have any significant health problem (e.g heart disease);
- Do not have any problem with your cognitive ability (thinking skills such

- problem (e.g heart disease);
- Have not had any kind of brain injury e.g stroke, brain injury, tumour.

- as memory);
- Have not had any kind of brain injury e.g stroke, brain injury, tumour;

Exclusion criteria for dementia group (Group 1)

- Aged under 60
- Unable to provide informed consent
- Pre-existing cognitive impairment e.g Learning Disability, acquired brain injury, stroke.
- Sensory impairment e.g blind or deaf
- Current or history of substance misuse, life limiting illness
- Cardiovascular illness

Exclusion criteria for control group (Group 2)

- Aged under 60
- Unable to provide informed consent
- Acquired brain injury e.g Stroke, traumatic brain injury
- Sensory impairment e.g blind or deaf
- Cognitive impairment evidenced by performance below clinical cut off for dementia on screening measures (<21 on MOCA).
- Current or history of substance misuse, life limiting illness
- Cardiovascular illness

Design

This study is a quantitative, within subjects design, with participants assigned to either the dementia group or the control group. All participants will complete the CRIq, GAI, GDS-15, NART, MOCA and demographic questionnaire. The control group will complete the Perceptual Reasoning Subtests from the WAIS-IV (Wechsler Adult Intelligence Scale- Fourth Edition).

Measures

The following measures will be used in this study:

National Adult Reading Test (Nelson, 1982)

The NART is a commonly used tool that provides an estimate of premorbid cognitive functioning based on word reading ability. Participants are required to read aloud 50 irregular words. It is quick to administer and frequently used with an older adult population (e.g Schretlen et al, 2005). NART is routinely used in clinical practice, and has been shown to have high correlation with premorbid intelligence and hold over time (Crawford et al, 2001). Similarly, NART performance has been shown to be stable over time, even in individuals who go on to develop dementia (McGurn et al, 2004).

Cognitive Reserve Index Questionnaire (CRIq, Nucci et al, 2011).

The CRIq is a self report questionnaire that aims to quantify the amount of cognitive reserve accumulated throughout an individual's lifetime. It focuses on three areas of cognitive reserve: education, working activity and leisure activities. It has recently been standardised in a sample of 558 individuals aged of 18-102, but has yet to be used with a clinical sample or an English speaking sample. It has recently been translated into English by the authors.

Geriatric Depression Scale- Short (GDS-15, Poon, 1987)

This questionnaire is a self-report questionnaire used to detect the presence of low mood and depression and was specifically developed for, and validated in, the older adults population (Sheikh, 1986). The GDS-15 has also been found to have good specificity and sensitivity in a meta-analysis of 42 papers (Wancata et al, 2006). This indicates that it can be reliably used as a screening measure for depression in later life.

Geriatric Anxiety Inventory (GAI: Pachana et al, 2007)

This is a 20 item self-report questionnaire used to measure anxiety in older people. It is reported to have good psychometric properties, with excellent inter-rater reliability (Pachana et al, 2007).

Montreal Cognitive Assessment (MOCA; Nasreddine et al, 2005)

The MOCA has been recently developed as a brief cognitive screening tool. It takes 10 minutes to complete, with participants achieving a score out of 30. The test includes aspects of language, attention, orientation, memory, naming and visuospatial/executive functioning. Many studies typically use the MMSE (Folstein, 1975) or ACE-R (Mioshi et al, 2005), (which contains the MMSE embedded into it), as a cognitive screen. However with recent issues regarding copyright of the MMSE, both of these screening tools are no longer being used by NHS [REDACTED] Psychology. The MOCA is copyright free, and has recently been validated as being more sensitive than MMSE in detecting mild cognitive impairment, Alzheimer's disease and Vascular dementia in an elderly population, using a cut-off point of <21 for MCI and <17 for Alzheimer's disease (Freitas et al, 2011a), and Vascular Dementia (Freitas et al, 2011b).

Perceptual Reasoning Subtests from the WAIS-IV (Wechsler Adult Intelligence Scale- Fourth Edition, Wechsler, 2008)

Three subtests from the WAIS-IV will be used to assess non-verbal ability in the control group; the Block Design, Matrix Reasoning and Visual Puzzles, which comprise the Perceptual Reasoning Index. The WAIS-IV is a well validated measure of current ability, frequently used for this purpose in an older adult population (e.g Baxendale, 2011).

Demographic Questionnaire (devised by Chief Investigator)

This questionnaire will be used with both groups to ensure that the participant meets the inclusion criteria. This will also gather details of non-dementia participants' GP details in the event that they can be contacted if the researcher becomes aware of any previously unknown psychological or physical health problem/s.

*Recruitment:**Control group*

Healthy controls will be invited to participate from the [REDACTED] and from the Scottish Dementia Clinical Research Network (SDCRN) carer participant pool. Members of the [REDACTED] will be provided with the Participant Information Sheet

(PIS) by the network and invited to participate. The SDCRN will identify carer participant pool members that meet the inclusion criteria, and will pass on those contact details to the Chief Investigator. They will then be posted a copy of the PIS and invited to participate. All participants will be invited to complete a tear off slip and post it to the Chief Investigator in they are interested in participating in the study. They will also be able to contact the Chief Investigator by telephone to ask questions and/or state their interest in participating in the study.

Dementia group

The dementia group will be recruited from NHS [REDACTED] Memory Clinics, from the SDCRN, and from the Scottish Dementia Working Group. Individuals with dementia that are registered with the SDCRN and who meet the inclusion/exclusion criteria will be identified by the SDCRN. Their contact details will be passed on to the Chief Investigator who will then post a copy of the PIS and invite them to participate. All participants will be invited to complete a tear off slip and post it to the Chief Investigator if they are interested in participating in the study. They will also be able to contact the Chief Investigator by telephone to ask questions and/or state their interest in participating in the study. Individuals recruited from NHS [REDACTED] Memory Clinics will be initially identified by clinical staff (Nursing, Psychiatry, Clinical Psychology) as meeting the inclusion criteria. Clinical staff will provide patients with the PIS to patients. Patients will complete a tear off slip and post it to the Chief Investigator in they are interested in participating in the study. They will also be able to contact the Chief Investigator by telephone to ask questions and/or state their interest in participating in the study. Finally, they can ask their clinician to pass on their contact details to the Chief Investigator, who will then contact the patient. Individuals from the SDWG will be initially identified by SDWG co-ordinators as meeting the inclusion criteria. The SDWG co-ordinators will provide members with the PIS. Members can express their interest in participating in the study, or to find out more information by either; completing a tear off slip and posting it to the Chief Investigator; by contacting the Chief Investigator via telephone or email; or by informing the SDWG co-ordinators that they consent to the Chief Investigator contacting them by phone, email or post (whichever they prefer). In this last instance, the SDWG co-ordinators will then pass on the member's contact details to the Chief Investigator, who will then contact the interested SDWG member.

Procedure

After participants have expressed an interest in participating in the study, they will be contacted by phone, email or by post (whichever is preferred by the participant) to arrange an appointment. Control Group participants will be sent the self-report questionnaires to complete before the appointment. Participants can choose where appointments take place; either within NHS [REDACTED] Premises at [REDACTED] or in their own homes (only if this is assessed as safe). Members of the SDWG will also have the option of conducting the appointment at Alzheimer Scotland premises.

Home visits will only be offered as an option to those participants who are known to the intermediary (e.g NHS clinician, SDCRN recruiter, SDWG co-ordinator), and where the intermediary has no concerns regarding risk to NHS staff visitors. Home visits will be

conducted in accordance with the NHS Lone Working Policy in order to minimise any risk of harm.

Appointments will last approximately 1 hour and comprise of the following procedure (see Fig.1):

- Clarification of meeting inclusion criteria (5 minutes);
- Read and sign consent form (5 minutes);
- Complete demographic questionnaire (Dementia Group) (5 minutes);

Check completion of self-report questionnaires (Control Group) or complete during appointment (Dementia Group) (15 minutes):

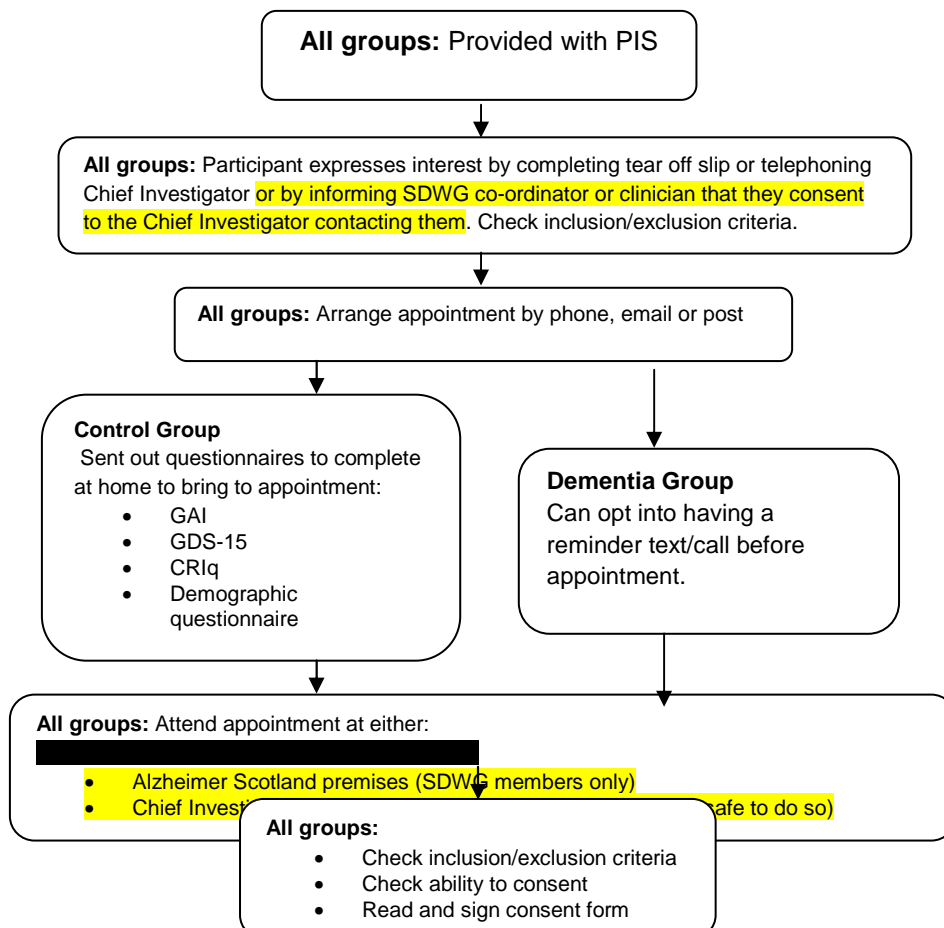
- Geriatric Depression Scale- 15 (GDS-15; Poon, 1987), Geriatric Anxiety Inventory (GAI; Pachana et al, 2007) and the Cognitive Reserve Questionnaire (CRIq; Nucci, Mapelli & Mondini, 2011);

Complete cognitive screening assessment (10 minutes):

- MOCA (Nasreddine et al, 2005) (10 mins)

Assessment of reading ability and intelligence:

- **Control group only:** Administer WAIS-IV Perceptual Reasoning Subtest (Wechsler, 2008) max 30 mins)
- Administer National Adult Reading Test – Revised (NART-R; Nelson, 1982) (10 mins)
- Debrief, opportunity to ask questions (5 minutes).



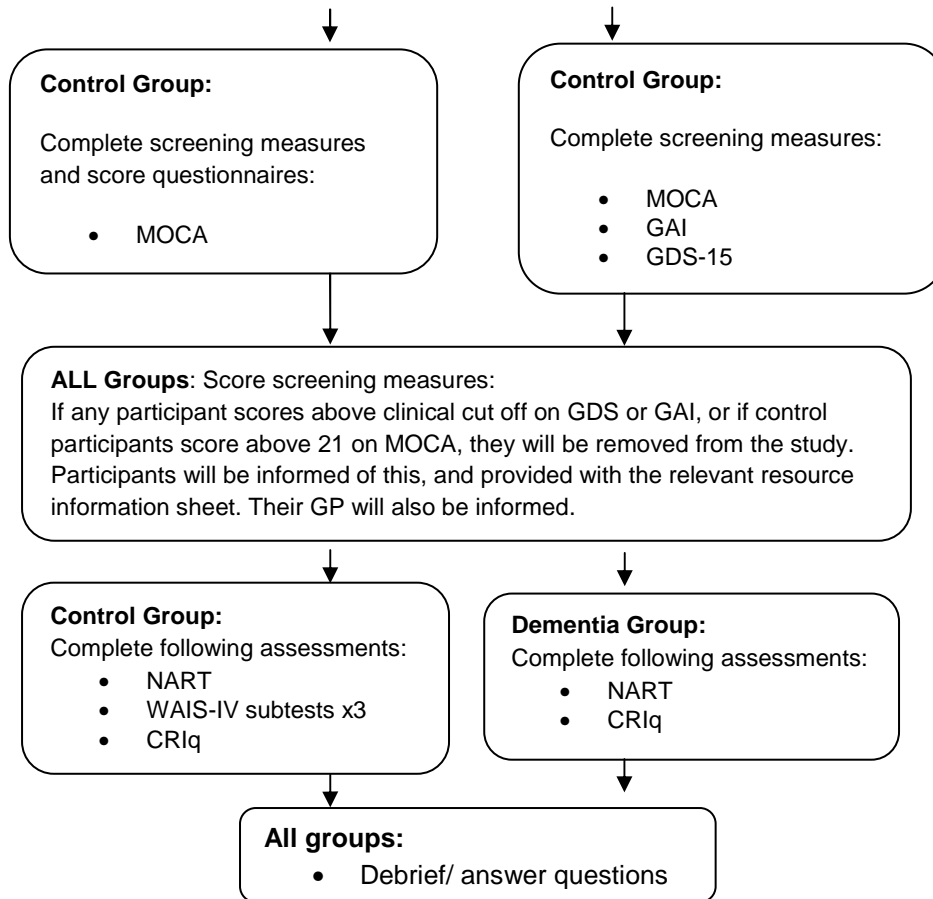


Fig 1: Summary of Procedure

All participants will be invited to take a break, reschedule the assessment or terminate participation if they become fatigued or distressed during the assessment. If participants become upset during the assessment, appropriate action will be taken. If participants are concerned about their memory after completing the assessment they will be advised to contact their GP. If participants would like to know about resources and support services for low mood, anxiety or dementia, they will be provided with an information sheet (see 'Resource Information Sheet 1' and 'Resource Information Sheet 2').

Statistical analysis

Correlational analysis will be used initially to assess the relationship between performance on all measures. Analysis of Variance (ANOVA) allows comparison between the ratio of systematic error variance to unsystematic error variance (Field, 2005) and will be used to compare any statistically significant differences in performance on all measures between the two groups. For example, a 2-way ANOVA can be used to identify any statistically significant

differences in performance on CRIq and MOCA between the control group and the dementia group.

Dissemination

The findings of the study will be written up as a Doctoral Thesis in part fulfilment of the Doctorate in Clinical Psychology. A more concise write up of the project will be prepared for publication in a peer reviewed journal. A brief write up of the study will be freely available to participants, and for publication in the [REDACTED] (and any other charities/organisations that may become involved). Poster Presentations summarising the research will also be given at relevant CPD events including the annual NHS [REDACTED] Psychology conference.

Appendix C4: Revised Participant Information Sheet – Dementia Group for study amendment May 2013. Changes to original are highlighted



Measuring lifelong ability and cognitive change

Participant Information Sheet

What is the study about?

This study is examining the relationship between different questionnaires and psychological evaluations, routinely used in the assessment of memory problems.

Why have I been asked to take part?

SDCRN Members:

This study has been approved by the Scottish Dementia Clinical Research Network (SDCRN). You have been invited to take part as you are registered with the SDCRN participant database, and have indicated that you may be interested in participating in research approved by the network. The SDCRN has identified that you may meet the criteria to be part of the study (included below) and so has passed on your name and address to the Chief Investigator. We are therefore contacting you to invite you to take part in the study. If you decide not to take part, this will not affect any future research you may be invited to participate in.

Through NHS [REDACTED] Memory Clinics:

You have been invited to take part as your clinician (e.g Doctor, Nurse, Psychologist) thinks that you may be interested in taking part in the study.

Through the Scottish Dementia Working Group (SDWG) and Alzheimer Scotland:

This study has been granted 'research access' by Alzheimer Scotland. You have been invited to take part as the SDWG co-ordinators think that you may be interested in taking part in the study.

What will I be asked to do?

The study requires participants to meet with the Chief Investigator (Jo Phillips), on **one occasion** for approximately **one hour**. We will meet either at the [REDACTED], or at an Alzheimer Scotland premises in [REDACTED], whichever is more suitable for you. In some exceptional circumstances, we may be

able to visit you at home. We will meet at a date and time convenient for you. Please note that unfortunately we are unable to reimburse your travel expenses.

At this meeting, you will have the opportunity to discuss the study and ask any questions you may have. If you still wish to participate, I will ask you to sign a consent form stating that you agree to take part in the study. We will also inform your GP (General Practitioner) that you are taking part in the study.

We will then complete a series of tasks including:

- A word reading task;
- Questionnaires regarding your mood and your occupational and educational history.

If at any point during the assessment you no longer wish to participate, you can withdraw from the study.

Do I have to take part in the study?

No. Your participation is entirely voluntary. If you decide to take part, you will be given this information sheet to keep and will be asked to sign a consent form.

Taking part in the study will not affect the care you receive from any NHS service now or in the future.

At any point during this study, if you no longer wish to participate, you can withdraw from the study without giving a reason why.

What are the possible benefits of taking part?

There will be no immediate benefits for participants taking part in the study. The study may, however, inform how the NHS assesses memory problems in the future.

What are the possible disadvantages or risks of taking part?

You may find completing the tasks tiring, or upsetting if you find them difficult. If this is the case we may need to take a break or reschedule a later meeting to complete the assessment. If you become upset we may need to let your GP or keyworker know. We can also provide you with information about other agencies or resources to access if you are worried about your mood.

Will my taking part in the study be kept confidential?

The study is confidential. The only people allowed to see the data are myself, my supervisors, and anyone appointed by the Sponsor to check the study is being carried out correctly. The data will be anonymised so that you cannot be identified.

We will inform your General Practitioner (GP) that you are taking part in this study. We will not inform your GP of any details about your performance on the assessment, unless you report any difficulties with your mood.

If you tell me anything that makes me think that you, or others around you, are at risk of harm, I would need to inform your GP and discuss with you how to address this.

The information I gather from you will be kept for 3 years after the research has been completed, in accordance with NHS Research Ethics Guidelines.

Will I find out the results of the study?

If you wish to know the results of the study we can provide you with a written summary. The study will be completed in August 2013.

What will happen to the results of the study?

The information I collect will be written up as a Doctoral Thesis as part of my Clinical Psychology training course. I may also publish some of the data as a piece of research in a scientific journal. Any information collected will be kept anonymous and only myself and my supervisors will be able to identify the participants involved.

Who is organising the research and why?

I am conducting this study as part of my Doctorate in Clinical Psychology. It will be written up as my Doctoral Thesis.

Who has reviewed the study?

The study proposal has been reviewed by the University of Edinburgh Doctorate in Clinical Psychology course and my supervisors (Dr. Ken Laidlaw and Dr Sandy McAfee). Ethical approval has also been granted by South East Scotland Research Ethics Committee.

What to do now?

If you would like to know more about the study or are interesting in participating, please complete the tear off slip and send it to:

Jo Phillips
Trainee Clinical Psychologist

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

If you do not wish to participate in the study you do not have to do anything. Thank you for reading this Participant Information Sheet.

I would like to speak to someone else regarding the study

If you would like to speak to someone else about the study please contact:

Dr Emily Newman
Health Psychology Lecturer
School of Health in Social Science
Old Medical School
University of Edinburgh
Edinburgh EH8 9AG
0131 651 3945

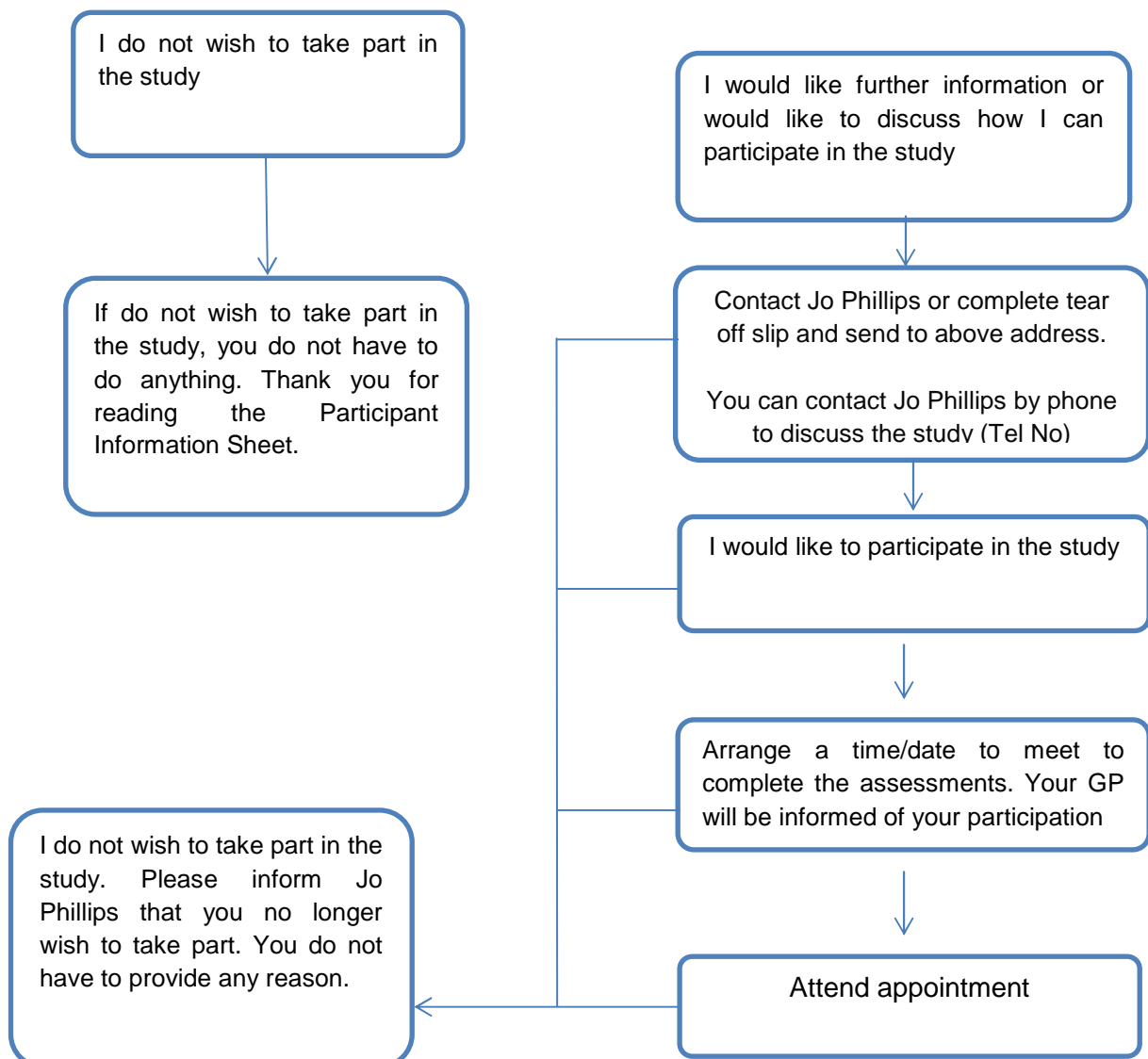


Fig 1. Flow chart explaining participation process.

Thank you for taking the time to read this information sheet

Jo Phillips, Trainee Clinical Psychologist

If you would like to participate in the study, or would like further information, please complete the tear off slip below and send it to:

Jo Phillips
Trainee Clinical Psychologist



Tear off slip here

Group 1 opt in form

“Measuring lifelong ability and cognitive change”



I would like further information regarding the above study ☐

I would like to participate in the above study ☐

My preferred location for an appointment is: (tick as many as apply to you):

☐

☐

Alzheimer Scotland premises in ☐ (SDWG only) ☐

In my own home (only in exceptional circumstances) ☐

Please contact me via telephone / email / post (delete as appropriate)

Name:

Address:

Email:

Contact No:

Appendix C5: Revised Participant Information Sheet – Control Group for study amendment May 2013. Changes to original are highlighted



Measuring lifelong ability and cognitive change

Participant Information Sheet





What is the study about?

This study is examining the relationship between different questionnaires and psychological evaluations, routinely used in the assessment of memory problems.

Why have I been invited to take part?

SDCRN Members:

This study has been approved by the Scottish Dementia Clinical Research Network (SDCRN). You have been invited to take part as you are registered with the SDCRN Carer's database, and have indicated that you may be interested in participating in research approved by the network. The SDCRN has identified that you may meet the criteria to be part of this study (included below) and so has passed on your name and address to the Chief Investigator. We are therefore contacting you to invite you to take part in the study. If you decide not to take part, this will not affect any future research you may be invited to participate in.


You have been given this Participant Information Sheet as you are a member of 
. The  has agreed to distribute this information sheet so that members can contact the Chief Investigator if they are interested in participating in, or finding out more, about the study.

How do I know if I can take part?

You are invited to take part in the study if you:

- Are over the age of 60;
- Do not have any problems with anxiety, low mood or have any diagnosed mental health problem;
- Are a native English speaker, and do not speak any other language fluently;
- Can read and write in English;
- Do not have any significant health problem (e.g heart disease);
- Do not have any problem with your cognitive ability (thinking skills such as memory);
- Have not had any kind of brain injury e.g stroke, brain injury, tumour;

What will I be asked to do?

The study requires participants to meet with the Chief Investigator (Jo Phillips), on **one occasion** for approximately **an hour and a half**. We will meet either at [REDACTED], whichever is more suitable for you. **In some exceptional circumstances, we may be able to visit you at home.** We will meet at a date and time convenient for you. Please note that unfortunately we are unable to reimburse your travel expenses. Before the meeting I will send you some questionnaires to complete at home before the appointment.

At this meeting, you will have the opportunity to discuss the study and ask any questions you may have. If you still wish to participate, I will ask you to sign a consent form stating that you agree to take part in the study. We will also inform your GP (General Practitioner) that you are taking part in the study.

We will then complete a series of tasks including:

- A word reading task;
- A memory task;

If at any point during the assessment you no longer wish to participate, you can withdraw from the study.

Do I have to take part in the study?

No. Your participation is entirely voluntary. If you decide to take part, you will be given this information sheet to keep and will be asked to sign a consent form.

Taking part in the study will not affect the care you receive from any NHS service now or in the future. At any point during this study, if you no longer wish to participate, you can withdraw from the study without giving a reason why.

What are the possible benefits of taking part?

There will be no immediate benefits for participants taking part in the study. The study may, however, inform how the NHS assesses memory problems in the future.

What are the possible disadvantages or risks of taking part?

You may find completing the tasks tiring, or upsetting if you find them difficult. If this is the case we may need to take a break or reschedule a later meeting to complete the assessment. If you become upset we may need to let your GP know. We can also provide you with information about other agencies or resources to access if you are worried about your memory or mood.

Will my taking part in the study be kept confidential?

The study is confidential. The only people allowed to see the data are myself, my supervisors, and anyone appointed by the Sponsor to check the study is being carried out correctly. The data will be anonymised so that you cannot be identified.

We will inform your General Practitioner (GP) that you are taking part in this study. We will not inform your GP of any details about your performance on the assessment, unless:

- You report any difficulties with your mood;
- Your performance suggests that you may have been having significant problems with your memory.

If you tell me anything that makes me think that you, or others around you, are at risk of harm, I would need to inform your GP and discuss with you how to address this.

The information I gather from you will be kept for 3 years after the research has been completed, in accordance with NHS Research Ethics Guidelines.

Will I find out the results of the study?

If you wish to know the results of the study we can provide you with a written summary. The study will be completed in August 2013.

What will happen to the results of the study?

The information I collect will be written up as a Doctoral Thesis as part of my Clinical Psychology training course. I may also publish some of the data as a piece of research in a scientific journal. Any information collected will be kept anonymous and only myself and my supervisors will be able to identify the participants involved.

Who is organising the research and why?

I am conducting this study as part of my Doctorate in Clinical Psychology. It will be written up as my Doctoral Thesis.

Who has reviewed the study?

The study proposal has been reviewed by the University of Edinburgh Doctorate in Clinical Psychology course and my supervisors (Dr. Ken Laidlaw and Dr Sandy McAfee). Ethical approval has also been granted by South East Scotland Research Ethics Committee.

What to do now?

If you would like to know more about the study or are interested in participating, please complete the tear off slip and send it to:

Jo Phillips
Trainee Clinical Psychologist

[Redacted]
[Redacted]
[Redacted]
[Redacted]

If you do not wish to participate in the study you do not have to do anything. Thank you for reading this Participant Information Sheet.

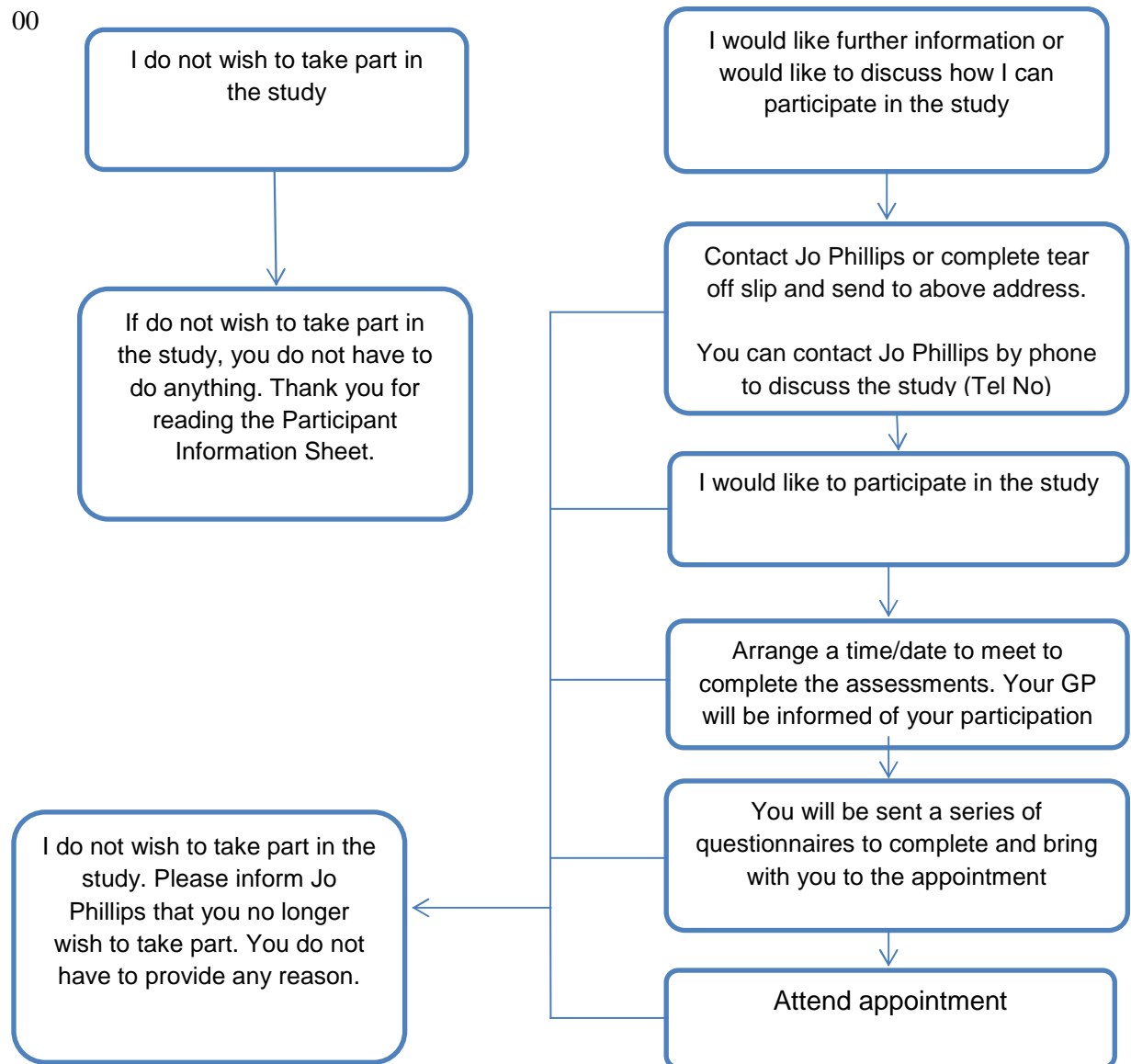


Fig 1. Flow chart explaining participation process.

I would like to speak to an independent advisor regarding the study

If you would like to speak to someone else about the study please contact:

Dr Emily Newman
 Health Psychology Lecturer
 School of Health in Social Science
 Old Medical School
 University of Edinburgh
 Edinburgh EH8 9AG
 0131 651 3945

Thank you for taking the time to read this information sheet
Jo Phillips, Trainee Clinical Psychologist

If you would like to participate in the study, or would like further information, please complete the tear off slip below and send it to:

Jo Phillips
 Trainee Clinical Psychologist



 Tear off slip here

Group 2 opt in form

“Measuring lifelong ability and cognitive change”



I would like further information regarding the above study ☐

I would like to participate in the above study ☐

My preferred location for an appointment is:

☐

☐

In my own home (only in exceptional circumstances) ☐

Please contact me via telephone / email / post (delete as appropriate)

Name:

Address:

Email:

Contact No: